SEP 27 1941

ENGINEERING NEWS-RECORD

SEPTEMBER 25, 1941

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ENGINEERING NEWS-RECORD

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Vol. 127 SEPTEMBER 25, 1941 No. 13

THIS WEEK

• The most difficult foundation problem in his 30-years experience is described by the contractor on a building job. Here 30 in. diameter open-end pipe shells ½-in. thick were driven as deep as 140 ft. to rock, 29-in.-dia. sockets drilled into bedrock, and structural steel H-cores concreted in to support each 1,275-ton column load.

• Ten pages comprise a special section on sewage disposal, which covers some novel developments in this field of sanitary engineering. Operators of both large and small plants will find something of interest.

• Originally designed as a 22-story steel frame, a New York apartment building was redesigned (due to delay in getting steel) to use reinforced concrete in the 16 lower stories with the last six stories of steel. How the principle of rigid-frame construction, controlled concrete with maximum column steel, and live load reductions allowed by building code, were used to overcome the problem of the size of concrete columns on ground floor are described.

THINGS TO COME

• "Defense Developed Buildings" will be the theme of a special section in the Oct. 23 issue. A group of ten articles will review the special design and construction features of outstanding buildings which the Army and Navy have rushed to completion during the last year.

• Army engineers have developed a cableway bridge consisting of welded tubular steel towers, cable and anchorage systems, which can be stowed on two trucks, erected in 3 hr. and can transport fifteen 13-ton vehicles per hr. in slings suspended from the cableway carriage. Details and description will appear in an early issue.

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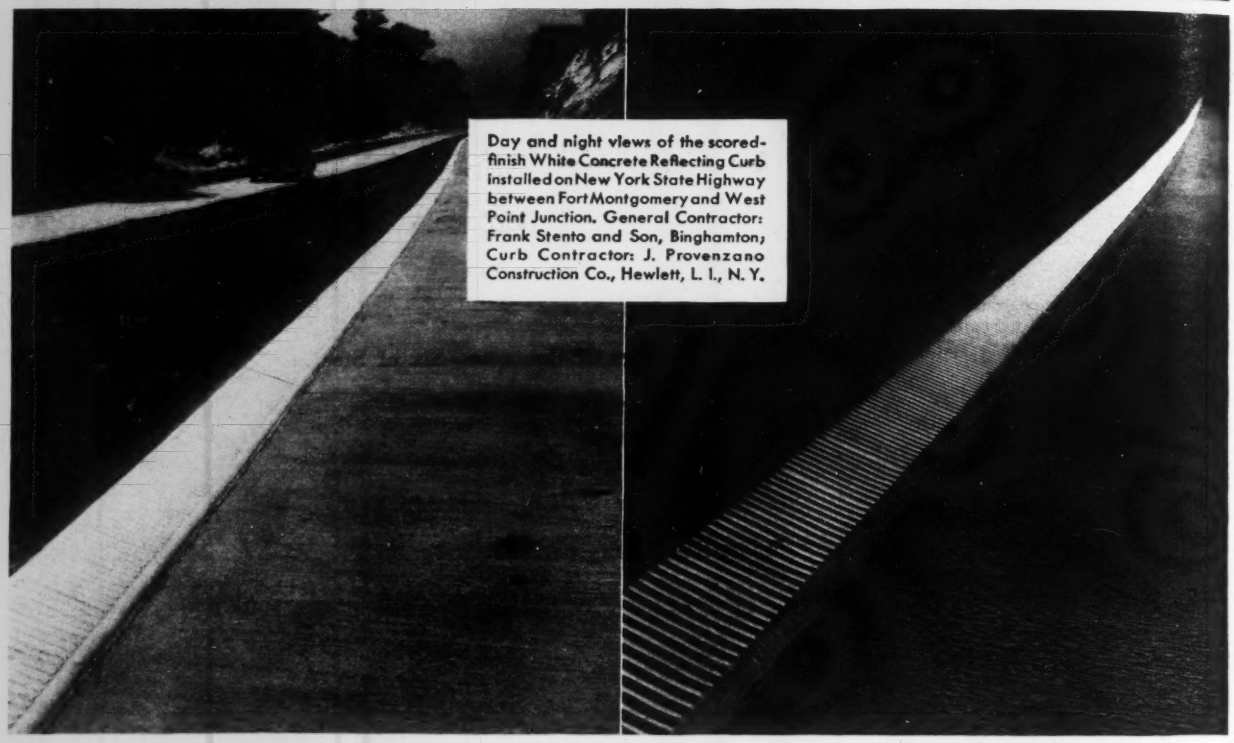
NEW YORK INSTALLS NEW SAFETY CURB

White Concrete Reflecting Curb greatly increases visibility and promotes safety on West Point Highway



Day and night views of the scored-finish White Concrete Reflecting Curb installed on New York State Highway between Fort Montgomery and West Point Junction. General Contractor: Frank Stento and Son, Binghamton; Curb Contractor: J. Provenzano Construction Co., Hewlett, L. I., N. Y.

NEW YORK has joined the steadily growing list of states that have installed or specified White Concrete Reflecting Curb—a new safety curb that reduces accidents by greatly increasing highway visibility, especially at night.

Visibility of a highway at night is largely dependent upon two factors: (1) efficiency of the driver's headlights; and (2) reflection of the headlight rays back to the driver's eyes.

Just as headlights would be ineffective if pointed to the rear, so is curb ineffective if the headlight rays fall upon a curb surface which does not reflect that light back to the driver's eyes. An object to be visible under car headlights must reflect the light back to the driver, not away from the driver. The more light the object reflects back to the driver, the more visible it is. This is true of curb. Curb is highly visible under car headlights when it reflects light in the proper direction; namely, back to the driver. *Direction* of the reflection is as important as the *amount* of reflected light.

For correct direction of reflection, White Concrete Reflecting Curb is of a saw-tooth design. For maximum amount of reflection, Atlas White cement is used because: (1) white surfaces reflect whereas dark surfaces absorb light; and (2) white concrete stands out in sharp contrast to surrounding objects, particularly at night.

The first complete book on White Concrete Reflecting Curb is yours for the asking. Mail the coupon today for your copy. Its 32 pages include theory, types, plans, and specifications. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

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ENR-M-24

Defense housing priority effective on 200,000 units

Help is limited to 200,000 privately-financed dwellings, and only work in designated defense areas will get ratings under adopted plan.

After months of delay, priority aid for builders of defense housing went into effect last week. As predicted, it is restricted to houses in 275 specified defense areas costing less than $6,000 or renting for less than $50, and in which defense workers will be given "reasonable preference." What this last means, no-one can say precisely. It does mean something; houses openly built for non-defense workers cannot get ratings.

An unexpected feature is that priority aid is limited to 200,000 privately-financed dwelling units. This is believed to be well under the number that would be built if there were no limits; during the interim period before the plan went into effect, the defense housing coordinator received applications for priority help on some 350,000 dwelling units costing less than $6,000 each.

The housing coordinator has split up the 200,000 units allowed among the various defense areas. Moreover, within each area quotas have been established for the different price classes. Within these quotas, ratings will be issued on a first come first served basis. Of course, if some quotas are not filled up in a reasonable time, they will be distributed among other price classes and areas.

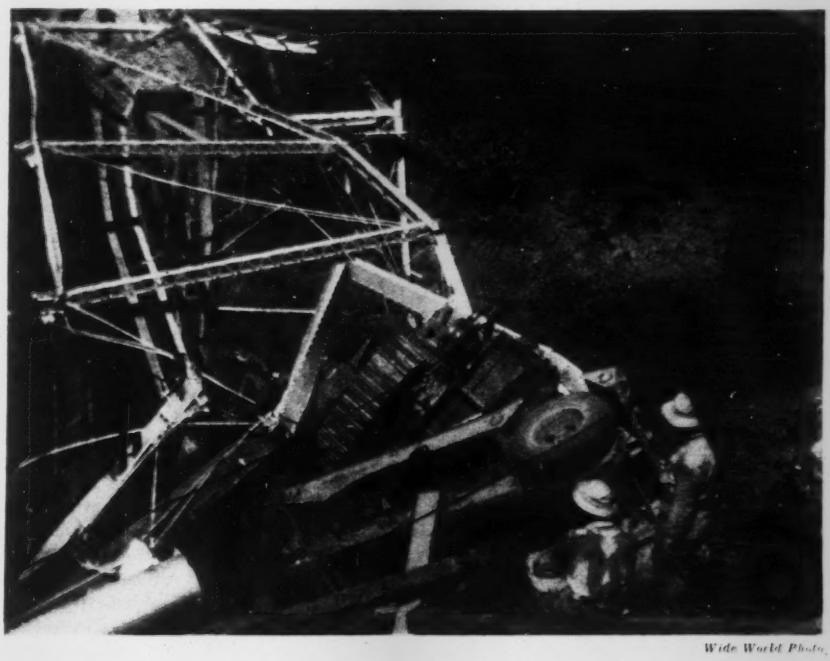
The priority rating to be granted to housing jobs will be a project rating of the P-19 type generally used for construction, with one important difference. The regular P-19 rating entitles the holder to attach a rating to his orders for anything on the Priorities Critical List. The P-19-c rating used for housing, however, can only be used for house-building equipment included on a special defense housing critical list, which is very restrictive. For instance, steel stairs and rails can only be used in multi-family dwellings; copper and brass water pipe is excluded; most hardware has to be of steel or iron and may not even be zinc coated except in places exposed to weather.

What rating is given to a project—A-2, A-10, or what—will vary with the urgency of housing in the particular area involved. Within each area, highest rating will go to projects already underway on Sept. 1 and to repair and rehabilitation projects; next highest will be for rental projects; and lowest for houses for sale. All will be A ratings.

Procedure in getting a rating for a privately-financed housing project is to fill out a special form, giving details of the project, and submit it, together with plans and specifications, to the nearest office of the Federal Housing Administration. Use of FHA offices is purely a matter of convenience and has nothing to do with the method of financing of the project.

The application is made by the builder of the project, but the owner must append a statement certifying as to the cost or the rent to be charged and promising to give preference to defense workers.

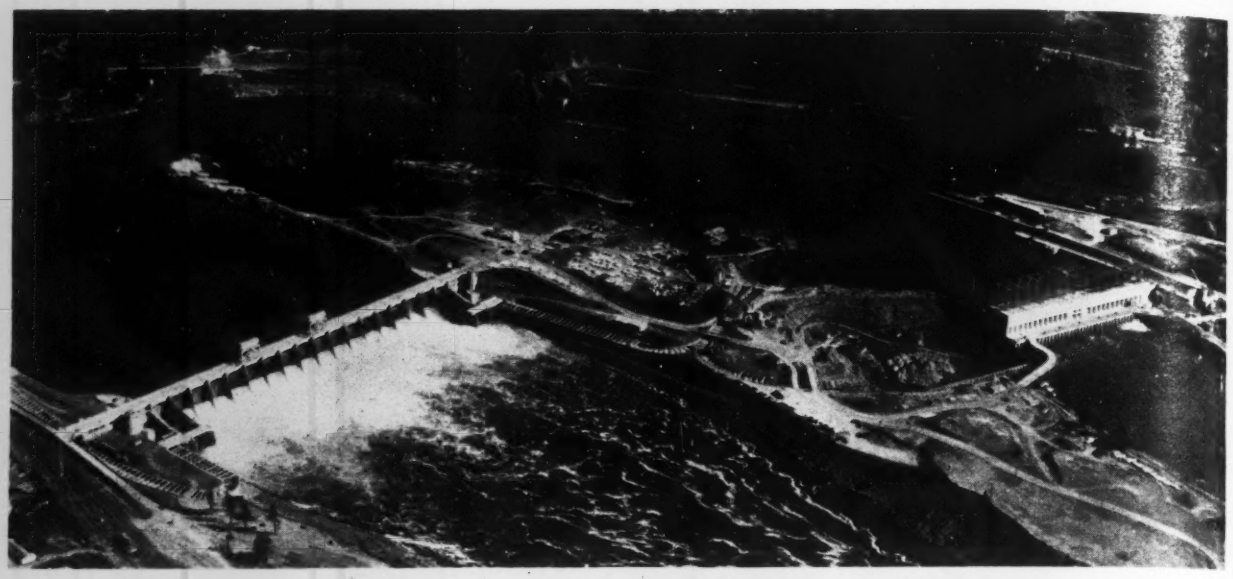
The FHA office passes on whether the application meets the eligibility requirements and then turns it over to an OPM field office, where it is examined by a representative of the housing coordinator who recommends whether the rating shall be issued. If his recommendation is favorable, the rating is issued by the field office. The whole process of application and receipt of a rating is expected to take about a week.



Wide World Photo

Army maneuvers cause bridge collapse

Weight of an army truck and trailer was too much for this highway bridge near Campti, La., Sept. 16, causing the structure's collapse. The equipment was being moved across the span as part of the army's maneuvers in the Red River area.



Bonneville power house being extended for four new generators

The excavation at the north end of Bonneville powerhouse (right center) is being made for an extension that is to house four additional 54,000-kw. turbines, thus bringing up to a total of ten the ultimate installation planned for this project. In the portion of the powerhouse already completed, four units are now in service and two more are in process of installation.

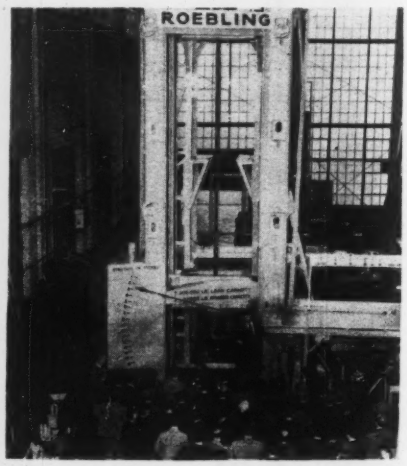
The ship locks can be seen at the extreme right of this picture on the Oregon shore of the Columbia River; the spillway dam with a small portion of the Washington shore is at the left. Bradford Island is in the center of the photograph.

Roebling firm celebrates its 100th anniversary

John A. Roebling sold his first wire rope in 1841 for a canal boat portage over the Allegheny Mountains, and in 1941, on Sept. 19, some of the results of this transaction were inspected and others were recalled in a celebration of the 100th birthday of the John A. Roebling's Sons Co. in Trenton, N. J. That first sale preceded by only six years Roebling's Monongahela River suspension bridge at Pittsburgh and the establishment of the present factory in Trenton from which came the wire for such other famous Roebling enterprises as the bridges at Niagara, Brooklyn and Cincinnati, as well as for the Hudson River crossing at New York and the Golden Gate span at San Francisco.

Best known to construction men for its bridge wire and wire rope, the company has also for many years manufactured a complete line of electrical wire and cable, wire cloth and other wire products. On its hundredth anniversary its plants are turning out harbor defense nets to repel torpedoes and submarines, cableways to transport our mechanized army across streams, degaussing cables to protect ships from magnetic mines and many other national defense items.

John A. Roebling, his sons Washington, Charles and Ferdinand, his grandsons Karl and Ferdinand, Jr., and his great grandsons Joseph, Ferdinand 3rd,



Breaking a 4-in. diam. wire rope in the company's huge testing machine was part of the Roebling birthday celebration. Ultimate load was about 1,500,000 lb.

and Charles Roebling Tyson, have owned and managed the company during its entire history. The grandsons were present at the anniversary dinner last week, at which editors and publishers of the nation's business magazines were the guests. The speaker of the evening was Leon Henderson, of the Supply Priorities and Allocations Board, and addresses were also made by William A. Anderson, company president, and Charles G. Williams, general manager.

Arizona may suspend federal-aid road work

Following the rejection of all bids on two highway projects by the Arizona State Highway Department, due to the bids being higher than the engineer's estimates, the highway commission of that state has revealed that it has already discussed suspension of those projects with Public Roads Administration officials. W. R. Hutchins, state engineer, said "Unless lower bids are received on the jobs the suspension of road building until defense work subsides is about the only alternative."

Joe P. Condrey, secretary of the Arizona chapter of the Associated General Contractors of America, in taking exception to Mr. Hutchins' statement reported: "Cost of raw materials, transportation, and labor have skyrocketed in recent months. Recent department estimates have been based on low bids on similar types of construction during the depression and are completely out of line with present emergency conditions. The highway commission itself sets the wage rates for all labor on highway construction, and has raised wages about 25 percent since 1937."

Priority rating A-7 has been obtained for one of the projects and, according to Mr. Hutchins, it will be re-advertised to determine if the greater certainty of materials supply will result in larger bids.

Railroad construction stimulated by defense

A total of 1,356 miles of new railroad line has been required to serve the new ordnance plants completed or under construction, according to Col. L. R. Groves, chief of the Operations Branch, Construction Division, Office of The Quartermaster General, in an address before the 56th annual convention of the Roadmasters and Maintenance of Way Association, at Chicago, Sept. 16. Other defense projects, such as camps and cantonments, aircraft factories and war industries plants, have added at least another thousand miles to the country's railroad mileage, estimates Col. Groves. As an example of railroad construction stimulated by defense projects, Col. Groves singled out the Ravenna ordnance plant at Ravenna, Ohio.

This plant is served by nearly 123 miles of new railroad track distributed as follows: Manufacturing areas, 22 miles; storage areas, 38 miles; service tracks, 28 miles; connecting tracks and yards, 18 miles; storage depot, 12.6 miles; and temporary construction, 4 miles. Preliminary estimates of railroad mileage at the time of the awarding of the contract was 35 miles. This mileage was increased to 70 miles as soon as the Atlas Powder Co., the operators, had more opportunity to study the problem and prepare a preliminary layout. Continual increases in storage facilities and additional manufacturing areas, including additional loading line capacity, has caused expansion in mileage to the present figure. A similar situation, stated Col. Groves, exists at most defense plants.

Col. Groves paid a tribute to the railroads for their cooperation not only in railroad construction but in handling supplies for construction of defense projects and establishment of commuter trains for taking care of construction workmen.

• • •

President requests money to start TVA dam job

Money to start the construction of Fontana Dam by the Tennessee Valley Authority was asked of Congress by the President this week. Rights to the Fontana damsite on the Little Tennessee River were ceded to the TVA by Aluminum Company of America last month. The President asked for $40,000,000; besides starting Fontana, this would also start construction of a $37,000,000 dam on the French Broad River near Dandridge, Tenn., and additional steam generating capacity at the Watts Bar steam plant. If approved by Congress, the new money will bring TVA's appropriations for this year to $160,000,000.

The French Broad River dam will be a 150-ft. high concrete structure similar in design to Cherokee Dam now under construction. By regulation of the river, it will permit generation of an additional 66,000 kw. at the downstream dams within eighteen months after start of construction. In addition, provision is made for installation of 33,000 kw. at the damsite itself. For details of the Fontana project see *ENR* Aug. 21, 1941, p. 255.

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CIO construction union claims 50,000 membership

Although the general use of AFL labor on defense construction has handicapped expansion of CIO's construction union, the Construction Workers Organizing Committee now claims a paid membership of more than 50,000 men, organized into about 400 locals. About 85 percent of this membership, it is said, is now covered by wage agreements. About half the CWOC membership consists of on-site construction men, the remainder being made up of truckers, building supply and sand and gravel workers, and the like.

CIO strength in the auto plants has made Detroit a major center of CWOC activity. There the union last week signed a closed shop contract with the Currier Lumber Co., employing about 1,400 men. This firm was recently low bidder, through a subsidiary, on 300 prefabricated housing units in Detroit for the Federal Works Agency. CWOC has concentrated particularly on organization of prefabricated house builders, and in this field it probably leads the AFL.

In Detroit also, an organizing campaign is under way among truck drivers. In recent months about a half dozen midwestern locals of the AFL teamsters, led by the Minneapolis local, have transferred to the CWOC.

At present, other centers of CWOC influence are in Pennsylvania among highway workers; in the District of Columbia, where the union controls most street paving; and on the West Coast.

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Large Cincinnati grade separation job awarded

A general contract of $459,076 has been awarded to Visitine & Co. of Columbus, Ohio, for the large Erie Ave.-Brotherton Road grade separation and bridge project in Cincinnati, which calls for improvement of crossings on the Pennsylvania R.R. Estimated total cost for this large project is $639,000 with the expenditure to be borne by the city of Cincinnati, the federal government and the Pennsylvania.

Hal G. Sours, Ohio state highway director, in announcing the contract award, pointed out that this department has drawn plans for the work and will supervise construction, although the state will supply no money for the project.

Second Phoenix slum clearance project completed

Second unit of the $1,800,000 slum clearance program at Phoenix, Ariz., was recently completed a month ahead of schedule. The project contains 224 apartments in 70 one-story buildings, which have concrete floors and walls of pre-cast concrete block. The roofs are red tile, while the interior partitions are of 4-in. thick concrete block units. To protect against the higher temperatures found in the Phoenix area, louvers are provided along the eaves of the buildings and a metal vent was built into the ridge of the roof. The ceilings are insulated with 4 in. of rock wool.

The project was constructed by the City of Phoenix Housing Authority, with the aid of USHA funds. Howard S. Reed is construction adviser for the work. The general building contract was held by the P. W. Womack Construction Co., and Lescher & Mahoney were architects.

BRIEF NEWS

THE NORTH CAROLINA HIGHWAY and Public Works Commission at a Sept. 19 meeting voted to grant sick leaves and vacations with pay to its maintenance workers. Previously only highway maintenance workers with at least five years service have been granted such privileges. The new ruling affects about 5,000 workers.

LAST WEEK a circuit court of the state of Florida fined an automobile driver of that state $1,000 and legal costs for damages to a highway bridge at De-Funiak Springs, Fla. The sentence was the outcome of a July 14, 1941, accident that wrecked the span, which was known as the Steel Bridge.

NEARLY 12,000 homes for defense workers built under the USHA supervision have now been completed, Nathan Straus, USHA Administrator, announced Sept. 18. Completions scheduled this month and next will add 6,152 to the total of 11,259 defense homes already finished in the agency's program, Mr. Straus reports.

FLOW OF WATER from the Quabbin Reservoir of the Boston Metropolitan District Water Supply was started Sept. 17. At that time discharge into the Wachusett Reservoir at the rate of 490 mgd. was begun. Boston officials report that discharge from the $65,000,000 Quabbin reservoir, which is estimated to obtain 110 billion gallons, will continue for about a month. This is expected to take care of the deficit in the Wachusett storage.

DAVID E. LILIENTHAL has been designated by President Roosevelt as chairman of the board of directors of the Tennessee Valley Authority. H. A. Morgan, who has been board chairman since March 1938, will assume the title and duties of vice-chairman, the post formerly held by Mr. Lilienthal. The change in chairmanship of the board was made at the request of Mr. Morgan.

AN EXPERIMENT to determine the advisability of changing army tents to "hutments" or quarters having solid sheathed roofs with 2x4-in. bracing over the standard tent frame will be conducted at Fort Jackson, S. C., the War Department announced Sept. 20. Tent frames in the entire area occupied by the 128th Field Artillery will be transformed by the Construction Division, Office of Quartermaster General, in a test to determine cost and suitability of the new type of living quarters as compared to tents.

Rail line abandonments total 2,500 mi. in 10 months

When the Interstate Commerce Commission recently gave approval for the Denver & Rio Grande Western R.R. to abandon its 125-mile branch line between Santa Fe, N. M., and Antonito, Colo., it completed action that made possible abandonment of 1,500 miles of railroad lines during the ten months from Nov. 1, 1940 to Aug. 31, 1941. According to the records of the Bureau of Statistics, a total of 25,163 miles of railroad have been taken out of service since 1921.

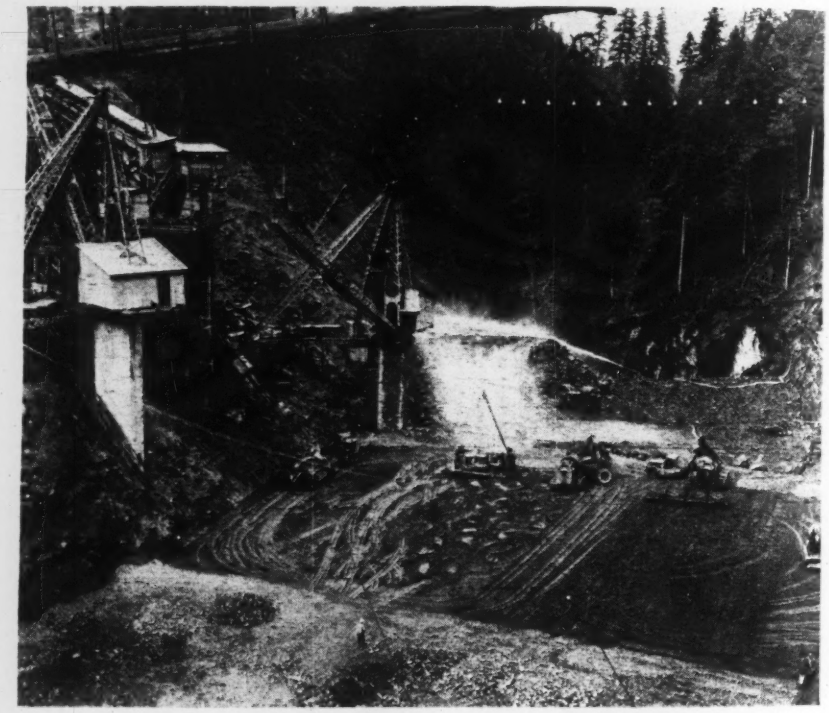
With the running of the last train over the Denver and Rio Grande branch, Santa Fe became the only state capital in the nation without passenger train service, according to the National Highway Users Conference, Washington, D. C.

• • •

Priority rating sought for Toronto sewage project

Officials of the city of Toronto, Ont., are attempting to obtain a ruling from the Canadian federal officials at Ottawa a priority rating for steel and other materials needed for construction at Toronto of a long-planned sewage disposal plant. The Toronto officials are asking that the work be given the same priority rating as defense projects.

Tenders were recently called for this 5½ million dollar project and two tenders were received by the city.



Mud Mountain Dam now 250 ft. high

Mud Mountain Dam on the White River near Tacoma, Wash., was 250 feet high, with 175 feet to go, when the recent picture above was taken. The dam, a flood control structure, fills a V-shaped canyon for a distance of about 1,600 feet. The earthfill structure will be 200 feet wide at the base, and 700 feet at the crest.

Looking toward the upstream toe, the picture shows the suspension bridge which workers use in crossing the canyon. Below the bridge, may be seen a string of floodlamps which light the project at night and are hung at the approximate elevation of the proposed crest. The belt conveyor system through which materials for the impervious core pass on their way from the heating plant are shown at upper left, while at the lower left may be seen a large tractor-drawn trailer being loaded with dried material through a chute. A second trailer, in the center, is spreading its load and a roller farther to the right is compacting the impervious core. On each side of the core is a transition zone of small crushed rock, with heavy quarry rock on the slope. In the rear, powerful streams of water are directed on the quarry rock to speed settling.

The two derricks at the left, now inactive, were used to lower core materials at the start of the project. The large tent used for protecting the earthfill work in the early stages has been taken down.

The dam is being constructed by the Guy F. Atkinson Co. of San Francisco for the U. S. Engineer Department.

PRIORITIES GUIDEPOST

Current notes on what, who and how

PRIORITY ASSISTANCE in obtaining operating materials as well as maintenance and repair equipment was granted last week to public utilities providing electricity, gas, water, sanitation service or steam. To use the rating, utility companies need only fill out a form stating that they are utilities and agreeing to abide by the terms of the Priority Division order and send a copy of the form to the Priorities Division of OPM.

Without waiting for any reply, the utility may then start using the priority. To do this, it merely attaches to the orders it places the following statement, signed by an officer of the company: "Purchase order for utilities operation, maintenance, and repair, preference rating A-10, pursuant to preference rating order number P-46."

The order includes restrictions on the amounts which utilities may buy. Essentially, these provide that inventories of maintenance and operating material shall be held to a practical minimum and that not more of anything shall be bought than was withdrawn from stock during 1940.

• • •

Preliminary study ends for International Alaskan road

Preliminary studies of the International Alaskan Highway have now been completed, according to Representative Warren G. Magnuson of the state of Washington, chairman of the international commission which has been studying the project. A definite location has been arrived at, and location surveys could start at any time.

Further steps now await the decision of the War Department and the Canadian-U. S. Joint Defense Board as to the relative priority to be accorded the project in accordance with the various steps planned for the defense of Alaska. The Joint Board has made some study of the matter, and the President is said to feel that at least a detailed survey of the road should be made now.

The proposed project calls for a 1,430-mile road, gravel surfaced and about 24 ft. wide. It is believed that it could be built in about two years at a cost of something less than $20,000 per mile. The location adopted would run east of the coastal mountains, where snowfall is said not to exceed about two feet in most places, and it is thought the road could be kept open in winter.

Representative Magnuson's office has maps available showing the proposed location of the Alaskan highway.

McLaughlin-Air Service Photo

North Carolina mountain highway improved

The North Carolina Highway & Public Works Commission, in cooperation with the WPA, is improving U. S. Highway 276 between Waynesville and Brevard. Now under construction is 8.3 miles of the route between Waynesville and the junction with State Route 280, northeast of Brevard. This section extends from Wagon Road Gap to Cruso, is the last remaining unimproved stretch on the 39-mile Waynesville-Brevard section, and is scheduled for completion by June 1, 1942.

The photo shows where U. S. 276 crosses the Blue Ridge Parkway at Wagon Road Gap at the Transylvania-Haywood County line. The road extending up the center of the picture is the parkway running west from Wagon Road Gap, the winding road to the left is U. S. 276 leading to Brevard, and that to the right is U. S. 276 continuing toward the town of Waynesville.

During the past year the North Carolina Highway Department rebuilt 3.5 miles of U. S. 276 between Bethel and Waynesville, while another 2.0 miles was held up due to right-of-way difficulties. The division office of the North Carolina Highway Commission at Asheville, John C. Walker, division engineer, is supervising the work.

WASHINGTON HIGHLIGHTS

THE SENATE has decided to reconsider a bill passed some months ago providing pensions for civilians who worked on the construction of the Panama Canal. The bill was passed without much discussion but Senator Adams of Colorado felt that the measure ought to be debated on the floor, thus it will be restudied.

FUNDS to accelerate generation of power on reclamation projects have been asked of Congress by the President. Of the $12,286,000 request, $6,000,000 will be used for installation of three more generators at Grand Coulee and $3,000,000 for transmission lines from Shasta and Keswick dams to Antioch, Calif.—site of a proposed steam plant for the Central Valley Project. One additional generator at Boulder Dam will cost $1,750,000, and small sums are provided for the Minidoka and Tucumcari jobs.

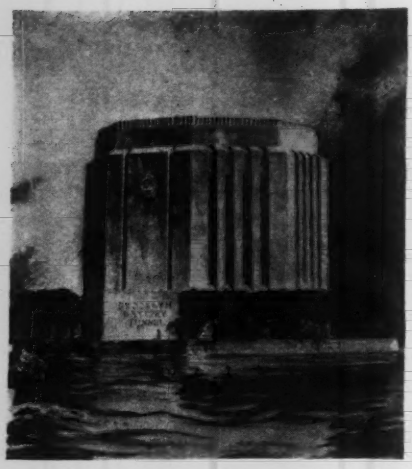
TRANSFER OF ARMY CONSTRUCTION to the Corps of Engineers was approved by the Senate Military Affairs Committee this week when it reported favorably on the pending bill to effect the change. In testimony before the committee the bill was supported by Under Secretary Patterson and Chief of Staff Marshall, though it was opposed by the Quartermaster General. Secretary Patterson said the bill had presidential support.

• • •

North Carolina to control billboards along highways

An ordinance requiring that billboards and other advertising signs be moved back to at least 50 ft. from the center of North Carolina highways was passed by the North Carolina Highway and Public Works Commission Sept. 19. The ordinance is effective Nov. 1, but billboard owners are given twelve months to relocate their signs.

The new regulation does not apply to advertising signs on places of business adjoining the highway.



Prize winning design for tunnel ventilation tower

The New York City Tunnel Authority has announced that the prize winning design and the $2,000 award for a mid-river ventilation building for the Brooklyn-Battery tunnel has been won by McKim, Mead & White, New York architectural firm.

The design contemplates a structure 125.6 ft. high, and only a few feet less in diameter than its altitude.

Construction of the shaft for the tunnel will be started next December, and is scheduled for completion in time for construction of the ventilation building to be started in November of next year. The mid-river ventilation building will be separated from Governors Island by about 100 ft. of water. It will rest on concrete foundations, which will be constructed on a shallow rock reef at that point.

The structure will have 12 fans for the intake of fresh air and as many for the exhaust of vitiated air. Together with the fans in the two other ventilation buildings, one situated in Brooklyn, and the other in Battery Park, in New York, they will supply a maximum of 4,150,000 cfm. of fresh air.

When the Brooklyn-Battery tunnel is completed, it will have a capacity of 16,000,000 cars annually.

Survey starts for ending Androscoggin pollution

The Maine Sanitary Water Board will take steps to alleviate conditions causing pollution of the Androscoggin River by making a survey of the river and by requesting communities and industries on the river to plan for the installation of industrial and municipal waste disposal plants. Metcalf & Eddy, consulting engineers of Boston, will conduct a six point survey involving: gaging, sampling and analysis of industrial waste dumped into river, laboratory studies relative to the treatment of wastes, and engineering studies sufficient to permit preliminary estimates of the cost of remedial measures.

JOBS OF THE WEEK

ORDNANCE WORKS, Choteau, Okla.
War Department, Washington, D. C., awarded contract for engineering, architectural, construction and operating services for Oklahoma Ordnance Works at Choteau to E. I. du Pont de Nemours & Co., Wilmington, Del. The total contract is $84,235,594. Construction will cost $45,982,478. and equipment $14,023,800.

MANHATTAN TUNNELS, New York, N. Y.
Mason & Hangar Co., Inc., New York, N. Y., was lowest bidder for constructing Manhattan portion of Brooklyn-Battery Tunnel, when New York City Tunnel Authority, New York, opened bids September 16. The low bid was $13,948,000.

WAREHOUSE, Navy Yard, Philadelphia, Pa.
Turner Construction Co., New York, N. Y., awarded the contract for construction of 8-story 273x403 ft. warehouse at Navy Yard by Bureau of Yards & Docks, Navy Department, Washington, D. C., $2,078,000.

MANUFACTURING PLANT, Kittanning, Pa.
James Stewart & Co., New York, N. Y., has been awarded a contract to construct manufacturing plant, including a boiler house, garage, and office building by Linde Air Products Co., subsidiary of Union Carbide & Carbon Co., New York, N. Y. Estimated cost $1,500,000. S. R. Donellon, New York, is company engineer.

INDUSTRIAL UNITS, South Boston (sta. Boston), Mass.
Morton C. Tuttle Co., Boston, Mass., will construct two buildings, including services and cranes, for Bureau of Yards & Docks, Navy Department, Washington D. C., $1,500,000.

SHIPYARD, Portsmouth, Va.
Dry Dock Associates, New York, N. Y., has been awarded contract by the Bureau of Yards & Docks, Navy Department, Washington, D. C., for constructing shipyard and shop repair facilities at St. Helena Coast Guard Station, in Norfolk County, near here. Estimated cost $6,000,000.

AIRPLANE PLANT, Long Beach, Calif.
P. J. Walker Co., Los Angeles, Calif., has been awarded contract for constructing airplane manufacturing plant addition by Douglas Aircraft Co., Santa Monica. Estimated cost $12,619,096. Taylor & Taylor, Los Angeles, Calif., are engineers and architects.

FLOOD PROTECTION, Corning, N. Y.
H. F. McLean Construction Co., Inc., White Plains, N. Y., will construct flood protection project Section 2, for U. S. Engineers, Binghamton, N. Y., at $697,892.

HOSPITAL, Pittsburgh, Pa.
F. J. Busse Co., Pittsburgh, Pa., has been awarded contract for construction of a 6-story, basement hospital by St. Joseph's Hospital, Pittsburgh. Estimated cost $500,000. Leo A. McMullen, Pittsburgh, is architect.

ROADS, Pennsylvania
A. B. Cole, Meshoppen, Pa., awarded contract constructing reinforced concrete paving structures on Legislative Route 212, Section 12, Traffic Route 6, North Towanda and Burlington Townships, Towanda and Burlington, by Pennsylvania State Highway Department, Harrisburg, Pa. $541,433.

AIRPORT, Bethel, Alaska
Morrison-Knudsen Co., Boise, Idaho, awarded contract by the Civil Aeronautics Authority, Washington, D. C., for grading, paving, and building airport at $1,566,358.

HOSPITALIZATION and MEDICAL SERVICES, San Antonio, Tex.
M. H. Moeller, San Antonio, Tex., is lowest for bidder constructing hospitalization and medical service building at Kelly Field. U. S. Engineer, Galveston, opened bids September 15. Low bid was $656,417.

CHEMICAL PLANT, Freeport, Tex.
The Austin Co., Stone & Webster Engineering Corp. and M. W. Kellogg Co., Houston, Tex., have been awarded the contract for constructing a $52,000,000 metallic magnesium plant for the Dow Chemical Co., Freeport, Tex. and Midland, Mich. The plant is for the War Department and will be financed by the Defense Plant Corp., Washington, D. C.

AIRBASE, Greenland
McWilliams Dredging Co., and Nick F. Helmers, Inc., New York, have been awarded a joint contract for constructing an airbase in Greenland for the U. S. Engineers, Northern Atlantic Division, New York. Estimated cost of the project is $20,000,000.

NOTE—Additional bidding and contract news on over 800 projects large and small appear in the Construction News section beginning on page 125.

Tunneling nearly complete on Delaware Aqueduct

The last of the major tunneling contracts on the Delaware Aqueduct was holed through on Sept. 17 when the Samuel R. Rosoff, Ltd., organization completed their driving of a 75,000-ft. section near Lackawack. This completes 83.8 miles of the tunnel to bring water from the west slope of the Catskills to New York City, and leaves only one mile of tunneling to be done, which is included in the Merriman Dam contract held by Mason & Hanger Co., Inc. Final holing through of the entire tunnel is expected next spring.

No advance was made on one heading of the Rosoff contract from July 30, 1940, to June 15, 1941, as excavation was halted by water-bearing rock encountered under Rondout Creek (*ENR* July 31, 1941, p. 150). A 7-ft. diameter lined center drift was advanced 220 ft. through the porous rock with radial grouting used to control the leakage sufficiently to permit excavation.

Completion of driving on the principal contracts on the Delaware Aqueduct appears to leave the world's record for greatest advance of a single heading with Alex Simpson, superintendent at Shaft 5 and Wm. Durkin, manager for Walsh Construction Co. This outfit recorded a 2,030-ft. advance in a selected period of 31 working days in one heading. At Shaft 4 of the same contract Geo. Underwood made an advance of 3,527 ft., in 31 working days on two headings. Three headings on this contract averaged about 47 ft. advance per day over the entire job.

Western competitor, and one time holder of the record, is John Austin of the Golden Cycle Corp. on Carlton tunnel in Colorado. Best advance in 31 days was 1,879 ft. but for the first 5½ miles of driving an average of 51.1 ft. per day was maintained in a single 8x9 ft. heading. Overall average was 48.7 ft.

The tunnel now under construction extends to Merriman Dam and is the first unit of a new water supply system which will eventually bring an added 540 mgd. of water to New York City from (1) Rondout Creek, a tributary of the Hudson River; (2) the Neversink River, and (3) East Branch, the latter two tributaries of the Delaware River. Completion of the unit to Rondout Creek (Merriman Dam) is expected in 1944, but full use of water from this area will not be possible until after completion of the dam in 1946.

Concrete lining of the tunnel is now completed or under way on the 11 contracts along the tunnel. Charles M. Clark, chief engineer of the Board of Water Supply of New York City, expects construction on the section between Kensico and Hillview reservoirs to be far enough along to permit emergency use of that length in the summer of 1942.

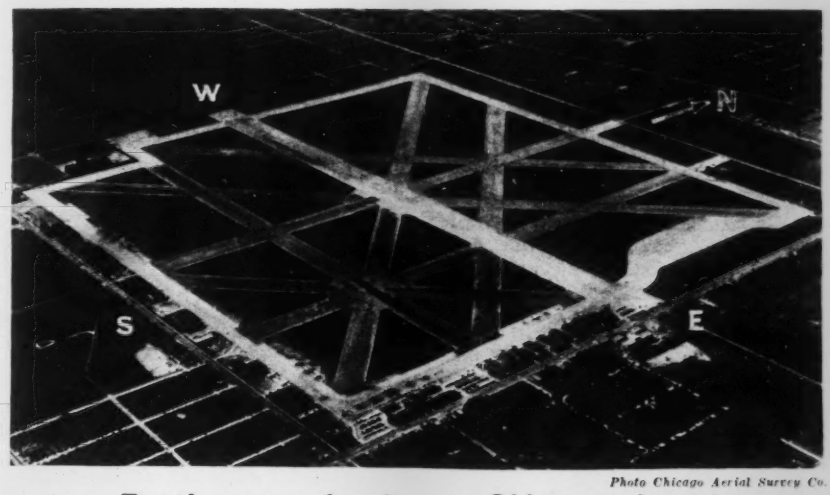


Photo Chicago Aerial Survey Co.

Track removal enlarges Chicago airport

After years of controversy the railroad tracks, formerly bisecting the Chicago Municipal Airport, have been removed and the runways have been connected across the old railroad right-of-way. Chicago now has one of the largest and finest airports in the country, with at least two serviceable runways in every direction. The above view is that greeting an incoming pilot, with nine runways to choose from for a landing. The main east-west runway, former location of the tracks, is 300 ft. wide; all others are 175 ft. Maximum lengths are: east-west, 4,749 ft.; north-south, 4,650 ft.; northeast-southwest, 6,047 ft.; and northwest-southeast, 6,546 ft. Total length of all nine runways is 44,515 ft., or nearly 8½ miles. The entire field is surrounded by surfaced taxiways.

Negotiations between the city and airlines for a new terminal building, to be built in front of the wide apron shown at the extreme right in the above view, were completed Sept. 16 and now await ratification by the city council. The airlines will loan the city $1,200,000, interest free, to be paid off in rental and landing fee credits at the rate of $120,000 per year, except that landing fees for the first two years will be paid in cash. Control and operation of the terminal will be by the city, a disputed point that has delayed consummation of the agreement for a period of four months.

• • •

Project to utilize Niagara power authorized

The Hydro Electric Power Commission of Ontario has authorized the start of certain preliminary work for construction of the new DeCew Falls power development near St. Catherines, Ont. The new station, which will replace the old DeCew Falls station of the late Dominion Light & Traction Co., will develop 65,000 hp. at 25 cycles. The new station will operate at a much higher efficiency than was possible at the old station, which generated power at 60 cycles.

Both the new and old power stations are so located that they utilize practically the full head at Niagara Falls, although located some miles to the west and obtaining water through some of the lakes connected with the Welland Canal system and the Welland River. Preliminary work now authorized includes access railways, construction camps and the preparation of specifications for the power house equipment.

Four more reclamation jobs on priority list

Parker Dam and Davis (Bullhead) Dam projects in the Arizona-California area, Anderson Ranch Dam in Idaho and the Colorado-Big Thompson project in Colorado have been placed in the national defense category. All of these Reclamation Bureau projects will be important power producers.

Parker and Davis dams are located on the Colorado River below Boulder Dam and these projects will aid in meeting power requirements for vital defense industries in southern California, Arizona and Nevada. The Anderson Ranch Dam in Idaho is designed to meet critical shortages of power in the Utah-Idaho area, while the Colorado-Big Thompson project in Colorado will supplement the power supply in the Denver area, center of defense activities in the Rocky Mountain region.

Previously assigned to the defense category were Boulder Dam, where additional power units are being added; the Columbia Basin project in the Pacific Northwest, which includes the Grand Coulee Dam; and the Central Valley project in California.

OBITUARY

LEON A. GOODALE, 65, superintendent of the bureau of water, Worcester, Mass., died in that city Sept. 17. From 1907 to 1928 he was engineer of reservoirs for the city of Worcester and was in charge of construction for the city's Pine Hill dam and reservoir. In 1929 he became water commissioner and registrar, and then superintendent in 1939.

JULIAN E. DANIEL, 41, former engineer for the North Carolina Highway and Public Works Commission and for the Florida State Highway Commission, died at Miami, Fla., Sept. 14.

FREDERICK A. DRAKE, retired civil engineer for more than forty years with the Bureau of Highways, New York City, died in Asheville, N. C. last week.

CHARLES P. MOWRY, 65, civil engineer of Seattle, Wash., died in that city Sept. 14. He was born in Enfield, R. I. and attended Brown University.

CHARLES I. SIGNER, who had been affiliated with the Washington state highway department as locating and resident engineer for about 30 years, died Sept. 11 at Winslow, Wash., where he had been working on a construction job. He worked as city engineer of Olympia, Wash. for a number of years.

R. B. THOMAS, 74, engineer of Stevens County, Wash. for a number of years, died Sept. 4 at Walla Walla, Wash., where he had made his home since 1938.

CHARLES W. FITTON, 56, prominent construction engineer of Seattle, Wash., died in that city Sept. 9.

NATHANIEL H. TUNNICLIFF, 61, civil engineer of Davenport, Iowa and former city engineer at Bettendorf, Iowa, died recently.

MAJ. FRED G. CROSS, 60, superintendent of Canadian Pacific Ry. irrigation department at Lethbridge, Alberta, died Sept. 9. He joined the Canadian Pacific in 1907.

ROSWELL F. BASSETT, 33, member of the civil engineering firm of Whitney & Bassett, Hyannis, Mass., died Sept. 16. He was graduated from Northeastern University in 1932.

RICHARD K. STEWART, president of R. K. Stewart & Son Co., building contractor, died Sept. 6 at High Point, N. C.

COL. EARLE L. LEWIS, 57, commander of the 109th Engineers of the South Dakota National Guard, died at Camp Claiborne, La. Sept. 17. Colonel Lewis had served as county engineer for Rapid City, S. D.

ALFRED D. BUTLER, city engineer of Spokane, Wash. for more than 22 years, died in that city Sept. 14. Mr. Butler joined the engineering department in 1908 and at the time of the World War became city engineer.

ELMOUR F. KIRTLAND, 71, a civil engineer with the Salem Engineering Co., Salem, Ohio, died in that city on Sept. 14. Early in life Mr. Kirtland worked with the American Bridge Co. of Youngstown, Ohio, before going to [illegible]bridge, Pa. to complete 40 years as structural engineer for the bridge firm, retiring in 1935 and then returning to active work a year ago.

HAROLD J. STEIN, 47, director of research, chemistry and metallurgy at the Allis-Chalmers Mfg. Co., died Sept. 9. Mr. Stein had directed those activities since 1939, when they were consolidated into one department upon the retirement of R. S. MacPherran, chief chemist.

ROBERT WILLARD CATLIN, 50, city manager of Farmville, Va., died last week.

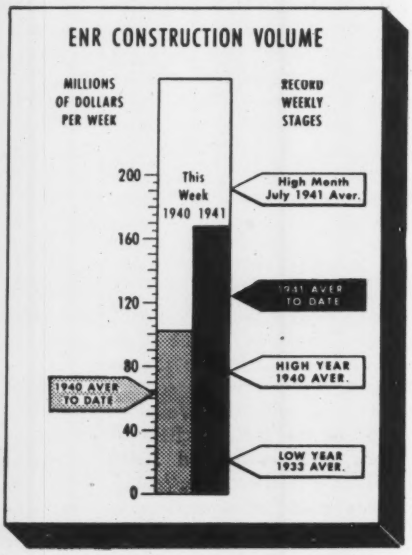
CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION awards for the week, $164,444,000, are 61 percent higher than in the corresponding week last year, and 37 percent over the volume reported last week.

The increased volume of industrial building construction boosted private awards 21 percent above the 1940 week, and 8 percent higher than a week ago. Public buildings reached the fourth highest peak of the year, and are responsible for the 70 percent gain in public construction as compared with a year ago, and the 43 percent increase over a week ago.

The current week's volume brings 1941 construction to $4,843,878,000, an increase of 93½ percent over the total for the 39-week period last year. Private awards for the period, $966,938,000, are 32 percent above the 1940 period, and public construction, $3,876,940,000, is 118 percent higher as a result of the 313 percent gain in federal work.

Two huge public building awards, $52,000,000 for the metallic magnesium plant at Freeport, Tex., and the $45,983,000 smokeless powder plant at Choteau, Okla., are primarily responsible for the fourth highest public building total of the year. In addition to public buildings, waterworks, bridges, industrial buildings and streets and roads are higher than last week; and waterworks, industrial and commercial buildings, earthwork and drainage, and unclassified gain over last year.



New capital for construction purposes for the week totals $9,350,000. This compares with $309,946,000 for the 1940 week. New construction financing for 1941 to date, $5,860,877,000, tops the total for the 1940 period by 106 percent.

CONTRACTS

(Thousands of dollars)

	Week Ending Sept. 26 1940	Sept. 18 1941	Sept. 25 1941
Federal	$52,020	$81,832	$123,490
State & Municipal	31,664	17,717	18,595
Total public	$83,684	$99,549	$142,085
Total private	18,493	20,766	22,359
TOTALS	$102,177	$120,315	$164,444
Cumulative 1941 (39 weeks)			$4,843,878
1940 (39 weeks)			$2,502,973

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1940 39 weeks	1941 39 weeks
NON-FEDERAL	$1,174,240	$1,034,759
Corp. Securities	201,533	311,817
State & Mun.	372,647†	344,282
U.S.H.A. loans	180,465	30,399
R.F.C. loans	195,595	84,761
R.E.A. loans	40,000	100,500
Federal Air—Hwy.	184,000	163,000
FEDERAL	$1,673,227	$4,826,118
TOTAL CAPITAL	$2,847,467	$5,860,877

†Revised.

FHA MORTGAGES

	Week Ending Sept. 21 1940	Sept. 13 1941	Sept. 20 1941
Selected for appraisal	$29,261	$26,893	$26,746*
Cumulative 1941 (38 weeks)			$1,094,632*
1940 (38 weeks)			$957,558

*Subject to revision.

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost	Sept. '41	263.12	126.48
Building Cost	Sept. '41	214.58	116.00
Volume	Aug. '41	434.00	190.00

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

On Classifying Soils

Sir: The article by Prof. Burmister (*ENR*, July 31, 1941, p. 171) entitled "Classification System for Composite Soils," presents a good method for classifying soils on the basis of their mechanical analyses, especially so as it takes cognizance of their grain-size distribution. However, we believe it would be better if such a classification system did not depend on any one particular size scale, such as the M.I.T. scale, or the "class designation of fineness" introduced for the first time in this article.

Using the method developed by Prof. Burmister, it is possible to designate the "mean grain size" and the dispersion without reference to any arbitrary size scales. Report the "mean grain size" in millimeters, as this gives a direct measurement of the size, and no advantage is gained in conversion into other units. The "mean grain size" carries to the mind a more direct impression of the place of the soil in the scale. Then, for the measurement of dispersion, determine the number of cycles on the log paper through which the line of mean slope extends from the 0-percent to the 100-percent axis.

By these changes the symbol for each of the three soils given symbols by Burmister would be:

#2 (1.0 — 1.4 — S)
#5 (.04 — 0.8 — S)
#8 (.003 — 2.3_c — S)

It is thus seen that this method gives symbols just as simple as the original method, gives a direct measure of the "mean grain size" in millimeters and does not depend upon one particular classification scale.

V. A. Endersby and T. K. Miles
Research Engineers, Shell Development Co. Emeryville, Calif.

Sir: Prof. Burmister's article is a very interesting treatise of a subject that is particularly important because so many engineers and soil scientists have become concerned with grain size distribution and yet no standard nomenclature or method of graphical representation has yet evolved. Prof. Burmister referred to the writer's paper, "Graphical Representation of the Mechanical Analyses of Soils," (*Trans.* A.S.C.E. Vol. 104 p. 150), repeatedly, but neglected to mention the central theme. The primary purpose of that paper was not to develop a new system of classification, but to seek a compromise standard out of the many systems in use.

It is gratifying to note that the author has accepted the proposed upper size limit of 0.006 millimeters for clay. The wisdom of proposing an overlapping region for clay and silt is problematical. It is true that the geologist is concerned with mineralogical composition and the agronomist with the chemical composition. On the other hand, the engineer has a distinct difficulty in understanding and making use of mechanical analyses of soils due to the lack of certain standards of definition. It would therefore seem desirable to establish the lower size limit of silt at 0.006 millimeters which is the upper size limit of clay.

Prof. Burmister's method of drawing the mean slope by balancing areas is more exact but less convenient than the method of connecting the intersections of the curve and the 20-percent and 80-percent ordinates with a straight line, as suggested by the writer. In balancing areas, difficulties may be encountered with samples having a high clay content. The projection of the curve to the zero axis is very uncertain.

The author has adopted an arbitrary system of numbers called fineness classes rather than the use of the mean grain size in millimeters. This is a further complication, for the engineer must become acquainted with a new scale rather than the familiar millimeter scale. In a similar manner the author substitutes the designation "dispersion" for the writer's "grade" and makes its value exactly double.

In passing, it should be remembered that Weinig, in a discussion of the writer's paper, proposed the following suffixes to indicate the shape of curve: convex—C; concave—K; s-type—S; linear—L. Prof. Burmister thus reverses the meaning of Weinig's "C" designation.

The author's definition of the modifying terms in Table II is a great improvement over the loose descriptive terminology in current use.

Frank B. Campbell
U. S. Engineer Office Nashville, Tenn.

Road Work Bogged Down

Sir: Reference is made to your issue of Aug. 14, the news article on the vetoed highway bill and also the editorial "Fast Action Needed."

Action, however fast, will be much too late for we are now up against the stumbling blocks of priorities, higher costs, labor shortage, and commandeered equipment and materials. I think the delay in providing funds for the strategic network, and particularly the access roads is one of the mysteries of all time, in view of the importance of adequate highway transportation in the present emergency.

There is noted your comment on the spread between the estimate of Congress and that of the President as to the amount required for immediate needs. The President is notoriously optimistic in these matters and you make no mention of the estimate furnished by all the states some months ago on the costs of bringing the strategic network up to the required standards. I think the point should be urged that even for civilian needs our highways are sadly inadequate and that the situation becomes more serious every year due to the lumping of more mileage upon the highway departments without adequate provision for financing the work.

H. C. Richards
Statistical Engineer, State Road Commission, Salt Lake City, Utah

Anonymous Letters

Anonymous letters will not be published in these pages unless the identity of the author is revealed to the editors. As a general rule, the editors hold that letters published in these columns should be signed, but there are cases when publication of the name of an engineer might cause embarrassment to the author or his employer. Under such circumstances, communications that are offered as anonymous letters should be sent to the editors with a carrying letter explaining why the author does not wish to reveal his identity.

EDITORIALS

VOLUME 127 NUMBER 13

September 25, 1941

Keeping Streams Clean

INDUSTRIAL ACTIVITY for national defense places a heavy burden of pollution on streams, directly as a result of larger waste discharges and indirectly because of a natural relaxation of pollution control efforts in this time of emergency. Much can be done to alleviate the effect of increased industrial waste flows, however, by operating municipal sewage treatment facilities at their highest efficiency. It seems particularly propitious, therefore, that the second annual convention of the Federation of Sewage Works Associations will devote the major portion of its program to operating problems and practices. Recognition thus is given to the operator as the key man in the present campaign to keep streams clean.

Beginning a Second Hundred Years

IN THIS YOUNG, dynamic and growing country of ours there have been only infrequent opportunities to celebrate the 100th anniversary of anything that is still alive or in service. The very essence of our progress has been in wearing out, tearing down or outgrowing what we have. Those structures or those organizations that have weathered a century of service in this rough-and-tumble atmosphere have needed strong foundations and good maintenance. These thoughts are engendered by the celebration last week of the 100th anniversary of the John A. Roebling's Sons Co., wire manufacturers. In John A. Roebling, social pioneer, bridge builder, inventor, manufacturer and scientist, the company had a strong foundation. To his sons, of whom Colonel Washington Roebling was best known to construction men, he bequeathed a spirit of progress that assured maintenance of the ideals of service that permitted the company to grow with the country instead of being trampled by the demands of progress. Thus the name Roebling, which was associated with early pioneering in suspension bridge construction at Niagara, Brooklyn and Cincinnati, is equally prominent in the pioneering of today as exemplified by such structures as the George Washington and Golden Gate bridges. A century of service is a record of which to be proud. The John A. Roebling's Sons Co., as it starts its second hundred years, has the best wishes of a construction industry of which it has long been such a prominent member.

More Dependable Foundations

ENGINEERS TODAY are going to greater and greater lengths to assure dependability in the foundations of their buildings and dams. This is well illustrated in two articles in this issue, one describing the drilled-in caissons for a large warehouse in the Brooklyn Navy Yard and the other the wall of caissons sunk to rock under the corewall of Merriman Dam for New York's Delaware water-supply system. In the Brooklyn work, 30-in. caissons, large enough for direct inspection, were sunk as much as 140 ft. to rock and then the H-section cores for the reinforced-concrete columns were grouted into 29-in. holes drilled an average depth of 6 ft. into the rock. These deep piers are in sharp contrast to the foundations of an adjoining warehouse built in 1918, which are concrete piles driven into the sand beds under the site and which have permitted considerable differential settlement. At Merriman Dam, the caissons definitely cut off any flow of water through underlying glacial deposits, whereas in the more commonly used sheetpile cutoff there is often the possibility that boulders and other impediments to driving may preclude a tight wall. Neither of the jobs represents the cheapest possible solution for the foundation problems involved. If dependability is the criterion, however, they meet the test with a minimum of uncertainty and are therefore truly economical.

Difficulties Can Stimulate Progress

PRESENT DEMANDS ON BUILDING design and construction, imposed by increasing defense restrictions, should stimulate a re-analysis of all existing methods, as well as promote the search for the new in materials and practice. There is much that can be accomplished in appraising and coordinating the best in modern building methods, and the present emergency may bring new economies out of established practices, which the profession has never taken time to assimilate. For example, it might utilize some useful but forgotten provisions of building codes; take advantage of careful concrete control more often; use structural welding more widely; give treated and grade-marked timber more consideration; or work out modifications of architectural demands that would permit the

structural engineer more latitude in getting the most out of the materials of construction. Some of these possibilities were embraced by the designers of a New York apartment house described in this issue, which demonstrates what can be accomplished under emergency conditions. Useful now, this type of design thinking will continue to pay dividends in more normal times.

Landfills for Refuse Disposal

LANDFILL DISPOSAL of refuse in New York City, once the subject of bitter local controversy, has shaken itself free of political sniping by proving its economic practicability. In the four years ending this December the city will have deposited about 43,000,000 cu.yd. of refuse in fills, as a result of which some 450 acres of submarginal land have been reclaimed. Equally important to the city are the savings in disposal cost, which this year alone are estimated to reach almost two and three-quarter million dollars. Not only are the filled areas being used as sites for public parks, but more recently they have assumed a new role in aiding local national defense preparations. As described elsewhere in this issue, landfills will make possible the extension of runways at Floyd Bennett field, and fill operations at Fort Totten are reclaiming tidal marshes for the extension of the post area. Cities that lack proper refuse disposal facilities and seek to improve their service might profitably explore New York's experience and practice.

Construction By and For the Army

CONSOLIDATION of the Construction Division of the Quartermaster Corps with the Corps of Engineers, as has been proposed to Congress by the War Department, would appear to be a logical step toward greater efficiency in army construction. And not only should it save the nation money and time in an emergency such as that of the present, but consolidation will be an advantage to both of the Army organizations involved. Neither has had a fair deal under the artificial division of authority that existed heretofore.

When the Quartermaster Corps, under its traditional responsibility for feeding, clothing and housing the Army, was ordered in the fall of 1940 to build cantonments for over a million men in a period of six months or less, it had neither the personnel nor the organization for such a task. Its capable construction officers who had done all peacetime building for the Army were overwhelmed by an impossible job. No organization could expand efficiently at such a rate as was demanded. The result was censure when, considering what actually was accomplished, it was praise that was deserved. Yet maximum efficiency unquestionably was not attained.

At the same time the Army Engineers, with a large regular and reserve officer personnel and an efficient civilian engineering force, organized into districts and experienced in handling large-scale construction on river and harbor work, were unavailable, so far as the great job of the moment was concerned. This despite the fact that their normal peacetime construction activities were being curtailed. Tradition had given the Army Engineers the job of building fortifications and building or demolishing engineering works in the theater of war, but it had kept them from doing peacetime building construction for the Army. Hence, even though they had been given the job of building the camps and munitions plants, they would have been handicapped by a lack of experience in this type of work.

So, from many angles, the consolidation promises advantages. It gives the Army, in one branch of the service, the efficient decentralized and experienced construction and contracting organization of the Corps of Engineers and the building design, construction and maintenance experts of the Construction Division of the Quartermaster Corps. It gives to these previously separate forces the abilities that each lacked separately, and it guards them against being made scapegoats in impossible situations. It furthermore assures the nation an efficiency in emergency defense construction which it has previously been denied.

There is one other advantage. When peaceful times come back again the men who served temporarily in the Corps of Engineers during this emergency will go back into civil life with a broader experience in construction operations than could have been obtained in either of the two agencies of the old set-up; and the professional soldiers who remain in the Corps of Engineers with its broadened scope of peacetime activities will gain the more diversified experience that is so essential to efficient expansion in some future emergency.

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EDITORIAL OFFICES: 330 WEST FORTY-SECOND STREET, NEW YORK, N. Y.

Fig. 1. One 34-ft. roadway of the projected dual highway to replace U. S. Route 3 in northeastern Massachusetts.

Massachusetts Builds Bypass Around City of Lowell

***Contents in Brief**—A bypass road around Lowell, Mass., which also is a link in a new main highway from the Boston metropolitan district north to the New Hampshire line, was put into service late in August. Built on a 500-ft. right-of-way to discourage encroachment, the 34-ft. pavement completed this year is to form the northbound lanes of a projected six-lane divided highway. Intersections with other main highways are separated.*

ONE 34-FT. ROADWAY on the first link in a six-lane divided highway that ultimately will run from Boston northwest to the New Hampshire line near Nashua was opened to traffic during the last week of August. This section of the projected highway was built first because it provides a badly needed bypass around the city of Lowell for traffic on U. S. Route 3 to and from Boston and the Merrimack River valley in New Hampshire. That the new highway also will serve as an important part of the nation's strategic highway network was demonstrated within a few hours after the opening of the road when motor convoys of the units "defending Massachusetts against invasion" in the regional army maneuvers made good use of it to avoid the congested streets of Lowell.

The projected reconstruction of U. S. Route 3, of which the highway now put into service forms a part, will start at a connection with one of the main superhighways serving the Boston metropolitan district somewhere in the neighborhood of Arlington and will run northwest, partly along the route of the old Middlesex Turnpike, but in major part on an entirely new right-of-way between U. S. Route 3 and State Route 4 to a point south of Lowell, and then passing to the west of Lowell will parallel the present U. S. Route 3 to the New Hampshire line but will be on higher land out of the flood plain of the Merrimack River and away from congestion along the river. At the New Hampshire line it will connect with the Daniel Webster Highway running north through that state.

The partly completed section of this highway that has just been put into service as a bypass for Lowell is 4½ miles long and cuts 1½ miles off the north-south route. It also will help to relieve congestion on State Route 4, a narrow road that has been extensively used heretofore to avoid

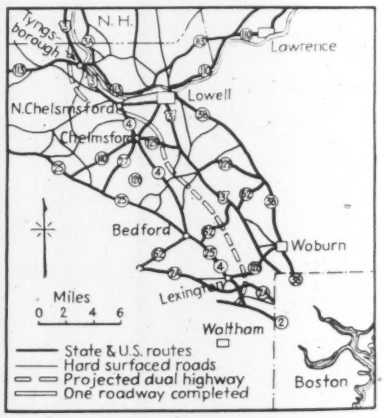


Fig. 2. Ultimately, the relocated U. S. Route 3 will leave the Boston metropolitan district in the neighborhood of Lexington and will run northwesterly along the route of the old Middlesex Turnpike between State Route 4 and the present U. S. Route 3 to a point south of Lowell, from where it will swing west of Lowell and on to the New Hampshire line.

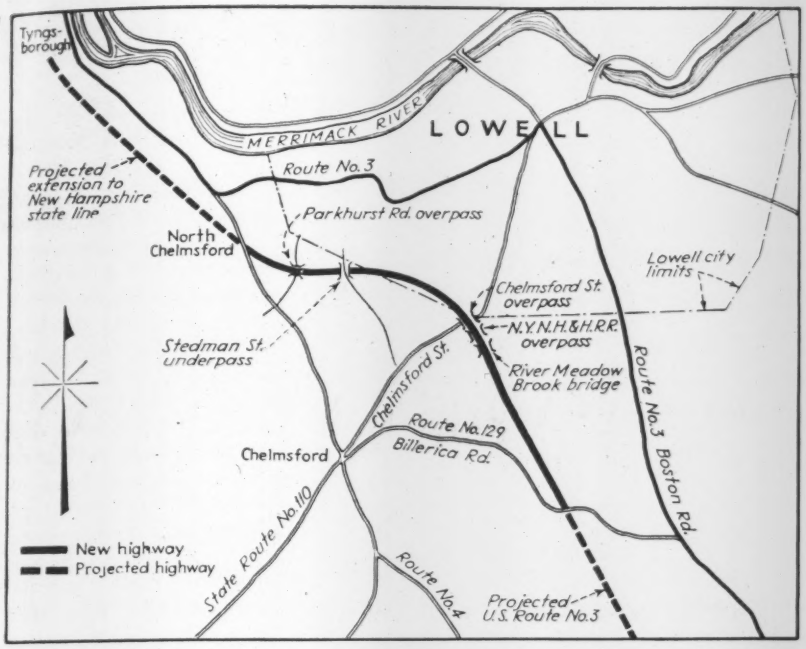


Fig. 3. Traffic bypassing Lowell on new U. S. Route 3 will follow Route 129 to its intersection with the new highway and then will continue over the new highway until it intersects State Route 4 near North Chelmsford.

passing through Lowell, by diverting part of that traffic over to U. S. 3 south of Lowell. Its relation to the existing highways and streets in the vicinity of Lowell is shown in Fig. 3, the grade separations being indicated. One street in the village of North Chelmsford, where the new highway now has a temporary connection with Route 4, crosses at grades as it cannot be separated until the new highway is extended. It is protected by automatic traffic lights.

A 500-ft. right-of-way, largely through undeveloped country, was acquired for the highway, chiefly to discourage encroachments as Massachusetts does not yet have a limited-access highway law to provide such protection. Because access cannot be restricted by the state highway department, some minor roads now enter the highway but do not carry enough traffic to constitute a serious hazard.

When grading was started on the highway in 1938 construction of six lanes was planned and the grading of the first 1½ miles on the south end is for the full six-lane highway made up of two 34-ft. roadways separated by a sodded median zone varying in width from 8 to 20 ft. Each 34-ft. roadway provides two 12-ft. traffic lanes and one 10-ft. parking lane. Last year, when the remainder of the work was put under contract, curtailment of funds made it possible to build only one roadway. Temporarily, this is being used for traffic in both directions, and because it is wider than the roads with which it connects at each end, it will serve adequately until the new route of which it is a part is completed.

No connections to Stedman St. and Parkhurst Road have been made, but at the crossing of Chelmsford St. (State Route 110) one-half of a full clover-leaf intersection has been constructed. The second half will not be built until the southbound roadway is added. This layout calls for a small amount of left turning, not enough to be an important factor.

A cross-section of the highway as ultimately projected is given in Fig. 4. Each 34-ft. roadway consists of a gravel sub-base 12 in. deep, a 4½-in. bottom course, crushed stone bound with sand, a 2¼-in. top course, crushed stone penetrated with 1¼ gal. of asphalt (OA-2) per square yard and sealed with 0.4 gal. of the same oil, and a peastone cover.

A 2-in. bituminous concrete berm laid to a 1 on 2 slope separates the pavement from the shoulders, which have a minimum width of 14 ft. Roughhewn granite edging is used along the central zone, also set on a 1 on 2 slope except at the drop inlets, where granite curbstones set vertical are used.

Th median strip is 20 ft. wide generally, being reduced to 8 ft. only at the bridges.

Construction operations

Grading of the first 1½-mile section at the southern end for the full width of the projected highway was done under a contract let to B. A. Gardett, Inc., in October, 1938, at a cost of $115,000. Current work is covered by two contracts: one totaling $385,000 to the Lane Construction Co., which covered surfacing of one roadway built under the Gardett contract and all grading, structures and surfacing on an additional 1½ miles of the road; the second, $267,000, to B. Perini & Sons, covering all work for one roadway for 1½ miles at the north end of the job, including reconstruction of a short section of Route 4 to improve conditions at the intersection in North Chelmsford. A considerable amount of work on the cross-streets at the separated intersections was included in the contracts. Both these contracts were let in July, 1940.

Excavation on both the current contracts was largely in sandy material, totaling about 568,000 cu.yd., and in

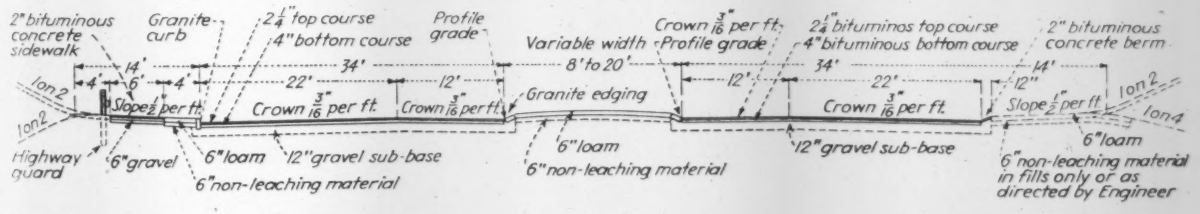


Fig. 4. Cross-section of the proposed superhighway to replace the present U. S. Route 3. Only the right-hand roadway has been built for the Lowell bypass.

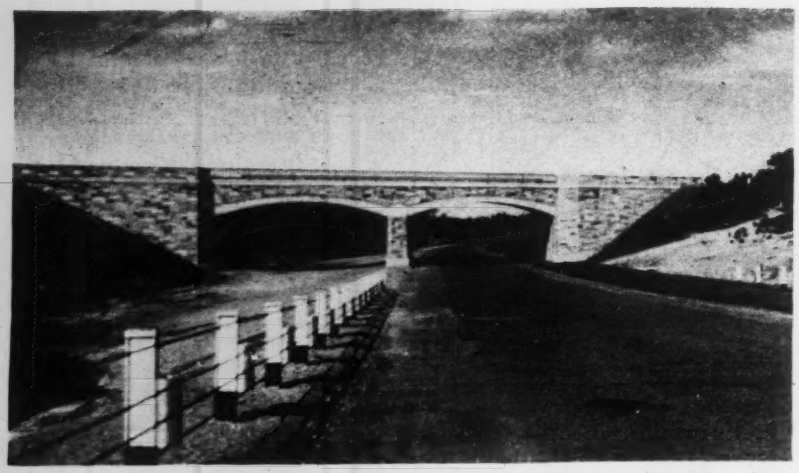


Fig. 5. The Stedman St. underpass was built to span both the present roadway and the projected parallel roadway.

peat in the swampy bottomlands over which much of the road is built. Only 7,000 cu.yd. of ledge rock excavation was involved. Over 100,000 cu.yd. of peat was excavated, chiefly in the Lane contract, and 33,000 cu.yd. of the peat was processed for use on slopes, shoulders and in the central parkway. About 50,000 cu.yd. of gravel from nearby pits was required for the sub-base.

Processing the peat consisted of spreading it in 6 to 8-in. layers for aeration, adding 0.5 lb. of lime and 0.2 lb. of fertilizer per sq.yd., and then working over the surface with a drag cultivator to mix in the lime and fertilizer.

In the extensive swamp operations on the Lane contract a crane with a 100-ft. boom and a 1½-cu.yd. bucket excavated the muck down to firm sand to depths of as much as 25 ft. This was stockpiled clear of the fill area where it could be rehandled to the fill slopes at a later date. Fill material was excavated in the pits with elevating graders and loaded into 12-yd. drop-bottom wagons which hauled it to the fill. A few 20-yd. carrying excavators also were used. On the fill, the material was dumped and spread with bull-dozers into 8-in. layers, tractors and hauling equipment being used to get the desired compaction. At the peak of operations, 6,500 cu.yd. of material were handled in an 8-hr. day.

Similar methods were used on the Perini job at the north end, where the somewhat shallower fills were built in 12-in. layers, using one of the 12-yd. wagons loaded with rock to compact the fill.

Because of the sandy character of the material in both cuts and fills, slopes were made flat to check erosion and facilitate growth of a grass cover. Cut slopes are 1 on 2 and fill slopes 1 on 4 or 1 on 2.

Structures

Five major structures were required, a bridge over River Meadow Brook, overpasses at the New Haven railroad line, Chelmsford St. and Parkhurst Road, and an underpass at Stedman St. All overpasses were built for one roadway, but the Stedman St. underpass was completed over both the present and the projected roadway. Abutments, piers and decks are of reinforced concrete, decks being carried on structural steel girders and paved with bituminous concrete. Details are given in Fig. 6. All the principal exposed faces of structures over or under highways are faced with broken-range seam-faced granite. Such facing was not used on River Meadow Brook bridge and the railroad overpass. On the latter structure the girders carrying the roadway over the rail line were encased in shotcrete and wrought-iron blast plates were attached to the bottoms of the girders directly over the track centers. In the other bridges the roadway girders are exposed and painted.

Roadway decks on all overpasses have a width of 34 ft. 9 in. between curbs, 9 in. wider than the roadway. Provision was made for widening all structures that have to be widened when the second roadway is added.

Construction of the highway was carried out by the Massachusetts Department of Public Works, of which R. W. Coburn is chief engineer. Resident engineers were Robert B. MacKinnon on the south end and John P. McManus on the north end.

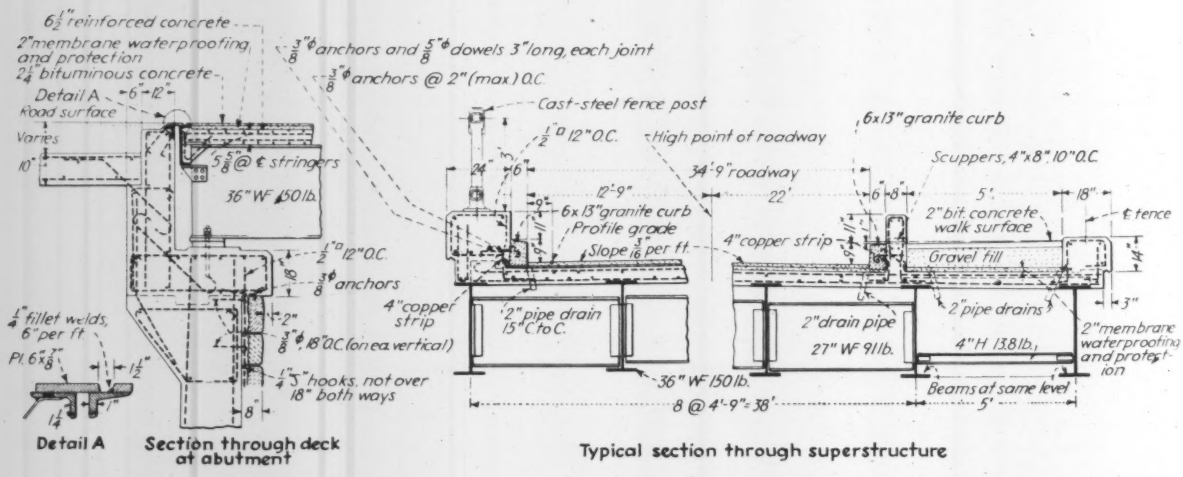
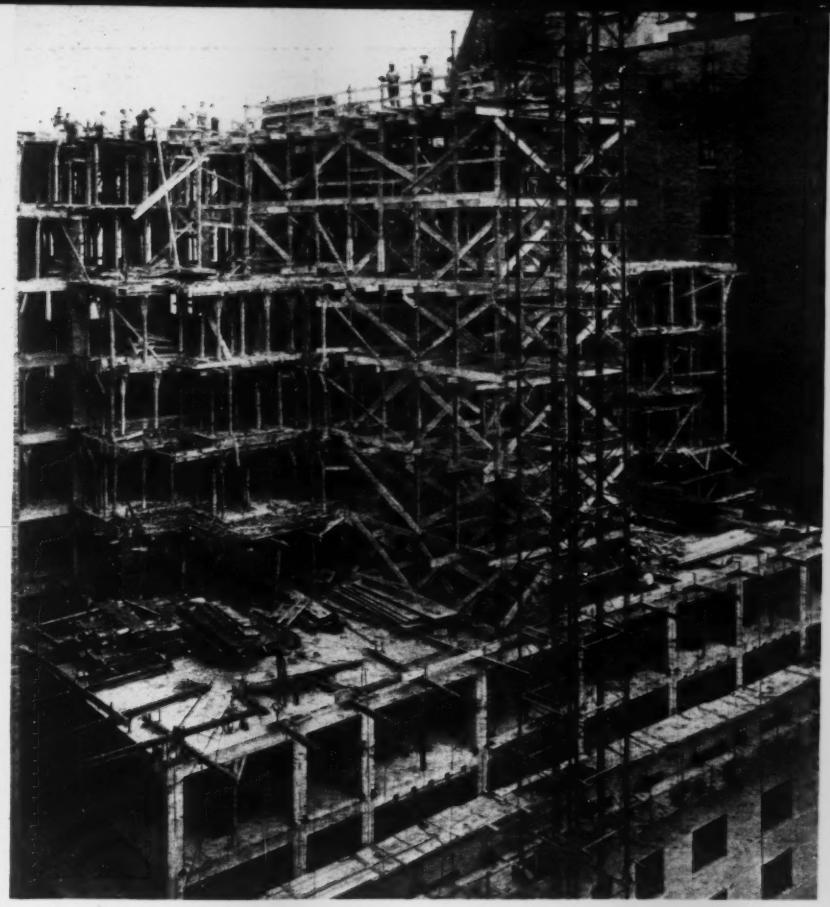


Fig. 6. Details of the deck of a typical bridge on the new highway. These details are from the Chelmsford St. overpass.

Sixteen Stories of Concrete— Six of Steel

Contents in Brief—*Originally designed as a 22-story steel frame, a New York apartment building was redesigned to use reinforced concrete in the 16 lower stories. Size of concrete columns on ground floor was the principal design problem. Solution included effective use of rigid-frame principle, controlled concrete with maximum column steel, and live load reductions allowed in building code. Required area for columns secured by using irregular shapes concealed in closets and partitions. Construction carried out at record speed of two floors per 35-hr. week.*



Completed 16-story frame of reinforced concrete. Steel stories go on top.

A 22-STORY APARTMENT HOUSE combining a reinforced-concrete structure for 16 floors and the six top floors framed in steel, which is being constructed at 40 Central Park South, New York City, represents a new type of building involving unusual design problems. Of special interest is the height of the reinforced-concrete frame, which was designed on the rigid frame principle and carries unusually severe column loads within the sizes dictated by architectural design requirements. Originally designed in structural steel, the problem of securing the necessary tonnage for the entire structure within the short time allotted for construction resulted in the change which was found feasible after extensive study of load requirements and critical dimensions of columns in the lower floors. Concrete design proved economical up to the setbacks on the 16th floor, and above this elevation the original steel design was retained because the columns did not carry straight up and introduced concentrated loads, which would have been difficult in concrete because of excessive girder sizes and connection problems.

Construction has been carried out at an extremely fast rate of two floors per week of 35 working hours. The solution of the more unusual design problems and the essentials of construction procedure are reviewed in this article.

The structure

The building is a high-class apartment house type of structure 124 ft. wide on the street side and about 100 ft. deep. The floor plan has the irregularities common to all apartment house architectural requirements, which introduce serious problems in developing any economical design of the rigid-frame type as the column spacing is non-uniform in both directions. On three sides the building rises to the 16th floor without setbacks, but in the rear the setbacks start on the 11th floor, with corresponding rearrangement of columns.

Typical of New York City apartment house design, the economic restrictions produced general design problems including the minimum depth permitted for floor framing, with a 9-ft. 1½-in. limit between finished floors, and a more serious restriction of permissible space for columns in the lower stories. These requirements have made reinforced-concrete framing a difficult design problem for this type of tall apartment house structure in New York City.

Original design

The original design of the structure was completed with structural steel framing. Column sizes in the lower floors had a 14-in. maximum H-section, which—complete with fireproofing—provided an 18-in. column under the plaster. General arrangement of the columns was retained in the final design, as is indicated in the accompanying drawing.

Following completion of the original design, financing studies for the project indicated an unusually short construction period would be available to permit leasing for a scheduled occupancy. Investigation showed that no reasonable assurance could be expected for obtaining the required tonnage of structural steel within the required period of time. On the other hand, there was a possibility that definite commitments as to delivery could be obtained on a part of the required tonnage.

At this stage of the project, the possibility of a reinforced-concrete design was investigated, although the limiting dimensions for columns, the shallow depth required for beams and the exceedingly irregular framing did not indicate that such a design would be a simple problem, and might be entirely infeasible.

Reinforced concrete design

Several design factors that have not been used to any great extent for similar building construction in New York City were combined in the design that was developed for this structure in order to make feasible the use of reinforced concrete. First, the rigid frame principle was used in the design of a structure for a height of 16 floors, in spite of the irregular column spacing. Second, a controlled concrete was used with a design strength of 3,500 lb., permitting a working stress of 875 lb. per sq.in. in the lower column section. Third, the provision of the building code permitting progressive reductions in live load (40 lb. per sq.ft. for apartment houses) to a minimum of 50 percent in a height of eight stories was used effectively in reducing column sizes in the lower floors.

The New York City building code provision which makes possible this progressive reduction in live load appears in Article 7—Materials, loads and stresses. Section 7.3.26—Reduction of live load, states:

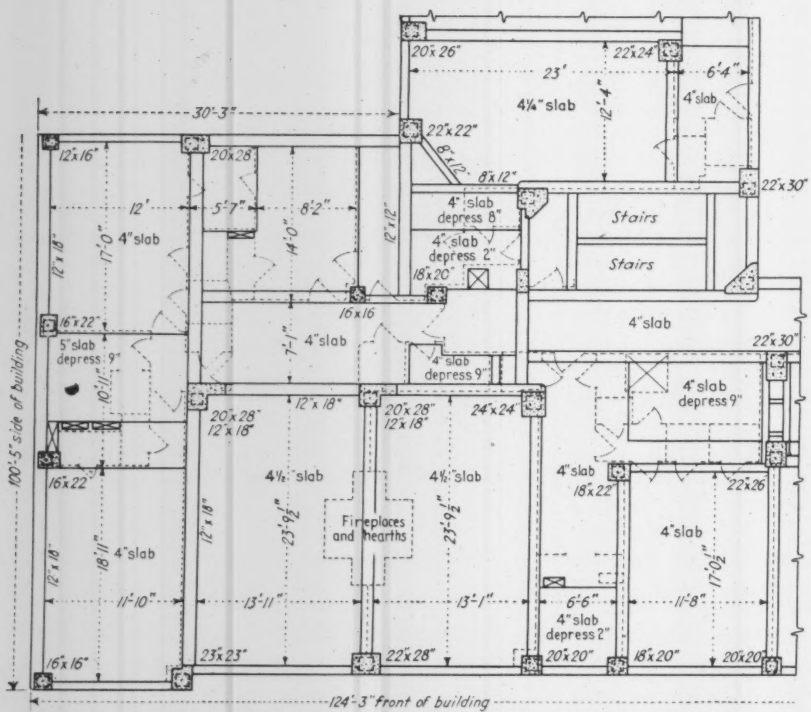
> In structures intended for all other purposes (not storage purposes) the assumed live load used in designing all columns, piers for walls and foundations may be as follows:
>
> 100 percent of live load on the roof
> 85 percent of live load on the top floor
> 80 percent of live load on the next floor
> 75 percent of live load on the next floor below
>
> and on each successive floor corresponding decreasing percentages provided that in all cases at least 50 percent of the live load shall be assumed.

Using these design factors, the study of a reinforced-concrete frame was undertaken. Column sizes in the lower floors were the critical factor and special study was required to provide the necessary cross-section area without interfering with architectural requirements. The original location and size allotted for the steel columns were used as a basis for the modified design, and additional area was secured within partitions and closets; in a few cases extensions within room areas were permitted by the architect. The final design introduced several irregularly shaped columns as indicated in the drawing, necessitating some eccentric loading from beams which were off-center (another element inherited from the steel design). Wherever possible the columns were increased in size along their major axis to enable the designing of a more rigid connection, with the introduction of increased bending moment in the column to facilitate the advantage of rigid frame design.

In the demand for minimum column cross-section area, those in the lower floors were designed to include the heaviest amount of steel allowed by the building code (0.04 percent) even though this did not result in the most economical combination of concrete and steel. As these columns were extended into the higher floors the steel was reduced and the column size retained up to the 10th floor. This design aided construction operations by maintaining column sizes for the maximum height. Between the 10th and the 16th floors the columns were designed with more economical relation between concrete and steel.

The maximum depth allowed for beams was 18 in. with span lengths up to about 22 ft. Slab spans up to about 13 ft., with a maximum depth of 4½ in., eliminated intermediate beams in room ceilings as provided in the original design. A 3,000-lb. controlled concrete was used for the beams and slabs. The light live load was a factor in permitting unusual connections between beams and columns that would not have been feasible in a structure carrying heavier loads on floorbeams.

One of the unusual architectural requirements was the depressing of the bathroom floors a depth of 9 in., with a corresponding 2-in. depression in the kitchens. This was done to enable the plumbing to be embedded in a cinder concrete above the structural concrete, permitting any repair or maintenance on the plumbing to be carried out without disturbing occupants of the apartment on the floor below. This design also permitted heavy piping to be installed on the floor rather than in the diffi-



Typical floor plan showing about one-quarter of the building area to indicate the arrangement of columns and the framing of beams. Architectural arrangement of rooms (light dash lines) illustrates the problem of securing continuity for a rigid-frame design. The approximate sizes of the steel columns planned in the original design are indicated in heavy dash lines. Note the relative size of the concrete columns and the special shapes used to secure necessary area. Floor slabs are depressed 9 in. in bathrooms and 2 in. in kitchens to accommodate plumbing. In general interior beams are 12x18 in., and spandrel beams are 8x15 in.

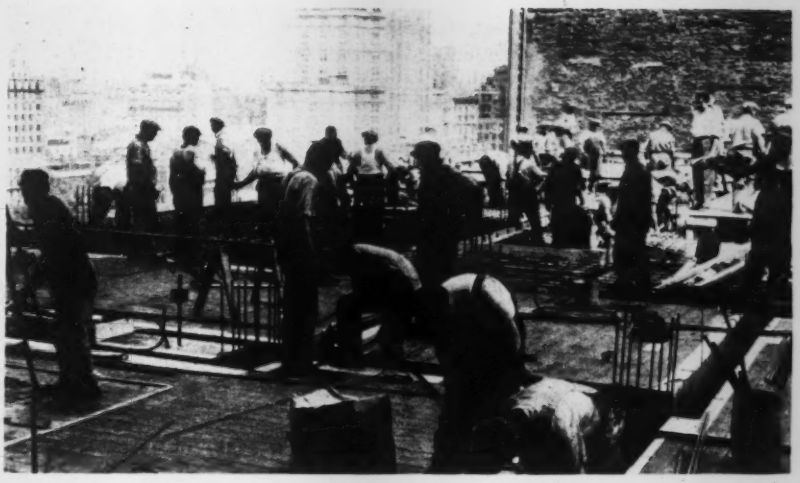
cult position on the ceiling with the need for furring and plaster below. The slab reinforcing for these depressed floor areas was carried across without special design, bending the steel as required and not resorting to separate beams in the vertical section.

Setback problems

On the 11th floor the setback started on the rear side of the building and the longer beam spans required and the concentrated loads introduced resulted in a combination of steel and concrete beams in these outside bays up to the 16th floor. The general principle adopted for this combination was to design the main girders and supporting columns, where setbacks occurred, in structural steel, leaving all other structural members and slabs designed in reinforced concrete. At intersection points where concrete girders framed into steel columns and adjacent steel girders, special supports consisting of steel shelf-angles were welded to the columns, and rigid connections were obtained by the use of continuous steel reinforcement over the supports and into the concrete surrounding the steel girders. Long span concrete arches between steel girders completed the framing around setback steel, thus eliminating all junior beams and holding the use of structural steel to a minimum.

As the setbacks occurred progressively from the 11th to the 16th floors, at the rear of the building, some of the concrete columns terminated at various floor levels, to be continued in steel from there up to the 16th floor level, where all concrete columns terminated. In order not to slow up the construction of the concrete frame during the erection of isolated steel beams and columns on the various setback floors, those sections of each floor (see illustration) were left for later completion.

The all-concrete areas were continued without interruption to the 16th floor by the use of construction joints in the bays adjacent to the nearest steel members at the various setback levels. This required leaving forms for six floors in these uncompleted bays. The plan provided for erection of a steel derrick on the 16th floor as soon as this level was reached, and then all the steel framing needed to complete the rear portions of the 11th to 16th floors would be set in one continuous operation. Completion of the concrete work on these various levels would closely follow the steel erection thus causing no interruption in the building program.



Construction speed is well illustrated by the size of this crew, which includes electricians, carpenters and reinforcing steel men in the foreground, with concrete pouring and finishing following close in the background.

Above the 16th floor a framing in reinforced concrete became decidedly uneconomical, because of the setbacks required on all four sides of the building, with corresponding changes in column spacing to meet architectural requirements in maintaining room sizes. Final decision was to leave the top six floors with the original design in steel, since it was possible to get assurance that delivery could be made on this tonnage in accordance with the construction schedule. Thus the program permitted an economical dovetailing of the schedule for materials.

The reinforced-concrete frame terminates on the 16th floor level with the setting of cast steel billets on the tops of the columns, with necessary anchor bolts and dowels. Steel erection continues from this elevation, in accordance with original design.

Miscellaneous design features

The structure is founded on heavy, driven steel casings from 12 to 20 in. in diameter, arranged to satisfy column loadings. A cluster of four of these piles was used under the footings of those columns carrying the maximum loads.

The exterior walls consist of a face brick with a 6-in. cinder concrete block back-up. The pouring of the lintel included the setting of bolts to which were attached steel angles using slotted holes so they could be adjusted as to elevation when the face brick was being laid up.

Construction procedure

Construction of the concrete structure followed relatively normal procedure with the exception of efforts made to develop an unusually high rate of progress. As a result of careful coordination between the various types of work required for pouring of each floor, a schedule was maintained which resulted in concreting two complete floors per week of five 7-hour days. Occasionally an hour or two of overtime per week was required among the various trades in order to maintain the proper sequence in this work.

Concrete was brought to the job in 6 and 8-yd. mixer trucks, deliveries including either the 3,500 or 3,000-lb. concrete as required. Hoisting was done in a 1½-yd. skip operated by a 125-hp. gasoline engine, giving a hoisting speed of 300 ft. per min. This rate of hoist was one of the small points which helped to speed up the work.

Wood forms of usual design were used, and these were built of tongue-and-groove lumber and were unlined since the rooms were all to be plastered. Forms were handled from floor to floor, either by hand or by a hoisting boom on the concreting tower.

Assuming that a pour completely finished one floor at the end of a day, on the following morning the use of high-early-strength cement enabled the column forms to be stripped before noon. A full 48 hours was allowed before stripping the forms on

the bottom of beams and slabs. While this work of stripping was under way the other set of the two forms which were used on the job was being set up on the floor above. As soon as this form setting was well started, the placing of reinforcing steel was begun and the trades began installations on the floor. The timing and organization of these crews provided the key to the remarkably fast construction schedule. Pouring of concrete often started before the complete floor was ready as to plumbing and electrical installations (see accompanying illustration).

Concrete pours were usually made at the rate of about 50 to 60 yd. per hour, resulting in the completion of an entire floor in approximately a 5-hour period.

Organization

The Industrial Engineering Co., New York, has carried out a special contract for the design and construction of the reinforced-concrete frame up to the 16th floor. Architectural design for the structure was prepared by Mayer & Whittlesey, architects. Charles Mayer was consulting structural engineer, and originated the plan for the design combination of reinforced concrete and steel. The general contract for the project was held by the Taylor Construction Co. The building is being erected by 40 Central Park South, Inc., L. Victor Weil, president.

West Virginia Compares Roadbuilding Costs

A COMPARISON OF COST of road construction of different types in West Virginia, over a term of years, is given in the March issue of *West Virginia Highways*, official bulletin of the State Road Commission. The costs are based on records developed by the Highway Planning Division, covering types of surface, types of labor and construction methods, soils and other factors. An interesting point is the showing that the cost of grading and drainage of mountain roads averages 33 percent more than for valley roads having approximately level routes. Figures for the two classes of roads are given in Table I, and show the continual increase in the cost of this work.

For hard surfacing that will permit all-year travel, the lowest types, and the cheapest to construct, are gravel, shale and stone base. The figures for these are also given in Table I. Next in importance are bituminous surfaces on non-rigid bases, while the most expensive are concrete, brick and bituminous or brick surfaces on rigid bases, as shown by Table II. All these surfacing costs are based on a strip of road one foot wide and a mile long. They thus indicate the increase in cost due to increase in width. Grading and drainage are not included.

When the state's highway program began, in 1921, an 18-ft. width was considered very wide; many roads had paved widths of 14 or 16 ft., and some had only a 9-ft. or one-lane strip. At present, the standard widths of primary roads are 18 ft. for light travel and 20 to 22 ft. for roads having heavy travel.

TABLE I—COST OF ROAD WORK; WEST VIRGINIA

Year	Grading and Drainage; per mile		Low-Type Surfacing for One Mile One foot Wide		
	Valley Roads	Mountain Roads	Gravel	Shale	Stone Base
	$	$	$	$	$
1914*	7,512	10,017	...	...	...
1917	8,803	11,739	...	...	...
1920	10,094	13,461	268	81	566
1925	13,145	17,530	290	84	562
1930	16,666	22,226	205	59	590
1935	16,025	21,370	315	64	495
1937	17,402	23,206	300	65	510

* Earliest record.

TABLE II—HARD SURFACING FOR ROADS; WEST VIRGINIA

Cost per mile per foot of width

Year	Surface Treatment	Bitum-Mix Surface	Bitum-Penetration Surface	Bitum-Concrete		Concrete	Brick	
				Base	Surface		Rigid Base	Non-rigid Base
	$	$	$	$	$	$	$	$
1918*	...	...	1,141	...	...	1,624	2,292	1,719
1920	...	...	1,032	...	...	1,577	2,226	1,670
1925	53	...	810	634	946	1,615	2,280	1,710
1930	76	304	568	608	822	1,410	1,990	1,493
1935	150	291	344	534	626	1,225	1,729	1,297
1937	127	275	332	530	635	1,270	1,793	1,345

*Earliest Record.

Dissolved Oxygen Studies With Activated Sludge

An instrument to record the dissolved oxygen level continuously in sewage treatment processes was described by Robert S. Ingols, New Jersey Agricultural Experiment Station, at the recent meeting of the American Chemical Society. Variations in the dissolved oxygen, measured by a dropping mercury electrode, produced changes in the current flow which were amplified and recorded upon a thread galvanometer for 24-hour periods. From laboratory experiments and activated sludge plant operation studies it was revealed that dissolved oxygen in activated sludge-sewage mixtures was related to the shape of the vessel in which the mixture was aerated.

Electrodes also were placed in the aeration tank of an activated sludge treatment plant and the dissolved oxygen levels at several points in the tank were recorded continuously. The first section of the tank showed no dissolved oxygen during the day period, while the dissolved oxygen increased during the night. There was a relatively large amount of dissolved oxygen in the final section of the aeration tank.

Landfills Aid National Defense

***Contents in Brief**—Both the Army and the Navy are benefiting from the landfill system of refuse disposal employed by New York City. Adjacent to Floyd Bennett field, which has been taken over by the Navy, a fill area of 120 acres is available for extension of runways. At Fort Totten on Long Island tidal marshes have been reclaimed and buildings erected on the fill. Operations at the latter place are described.*

LANDFILL REFUSE DISPOSAL in New York City, which has become an important factor in the reclamation of submarginal land, assumes a new role in aiding national defense preparations in this metropolitan area. Operations now under way at Fort Totten and on a site adjacent to the Floyd Bennett airport recently acquired by the Navy, reveal the adaptability of city refuse as an economical and suitable fill material.

At Fort Totten one section of "made" ground already is in use as a site for storage buildings and garage facilities, while another area partly under water is being elevated some 18 ft. to provide a site for an athletic field. At Floyd Bennett Field, adjacent to which the city owns considerable swampland, landfill operations have been conducted for several years adding, to date, some 120 acres of usable ground for the extension of airport facilities.

The landfill system of disposal, introduced to New York in 1937 by William F. Carey, commissioner of the department of sanitation, is a carefully controlled dump-and-cover operation. Essential features include: (1) deposition of refuse from collection trucks at the edge of a fill; (2) spreading and compacting deposited material by means of 20-ton bull-dozers; (3) spraying at intervals with an emulsified solution of a chlorinated hydrocarbon compound to minimize odor and fly breeding; (4) covering the top and exposed face of the refuse fill with 12 to 24 in. of earth at the close of each day's operations. Cover material for the last operation is obtained from a trench dug in advance of the fill or it is brought in from nearby excavation projects. The depth of fill varies from 8 to 12 ft., depending on the desired final elevation and the topography of the area.

Present technique is a refinement of operations first described in *Engineering News-Record*, Sept. 1, 1938, p. 270. The carefully controlled methods evolved after several years' experience, including a description of a strip filling system developed by A. J. Lizee, deputy commissioner in charge of landfills, are detailed in *ENR*, Dec. 5, 1940, p. 764.

Scope of work

An idea of the magnitude of the New York landfill operations is gained from the 1941 records, which reveal that some 45 percent of the 27,000,000 cu.yd. of refuse collected annually in the city is used for fill. Of the remainder some 8,000,000 cu.yd. are disposed of in the city's eleven incinerators, and about 7,000,000 cu.yd. is deposited on Riker's Island near La Guardia airport, where a modified fill-and-cover procedure is employed. Plans are almost completed to transfer this latter operation to a huge landfill project in the Bronx where a park will be built. In 1942, therefore, it is estimated that 70 percent of the city's refuse will go into landfill.

Aside from the values created by reclaiming submarginal land, use of the fill system of refuse disposal saves the city a considerable sum of money, according to Department of Sanitation records. Here are shown comparative cost figures of 30.5 cents per cu.yd. for incineration and 7.5 cents for landfill (excluding collection costs but including interest and amortization charges). Thus, on the basis of 1941 estimates of 12,000,000 cu.yd., a saving of about $2,760,000 will

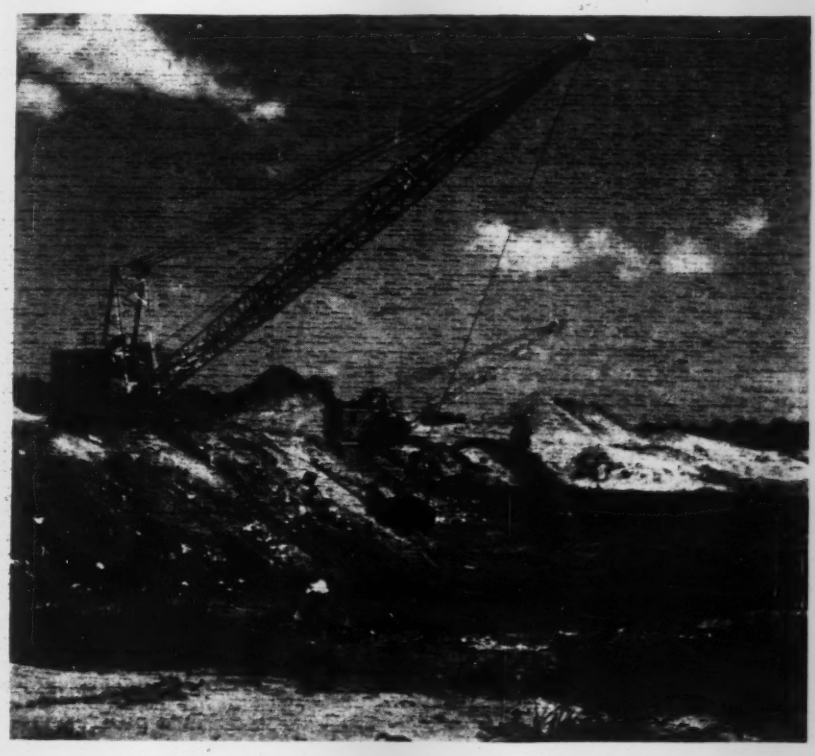


Fig. 1. Earth is excavated in advance of the fill in order to provide cover material for the deposited refuse.

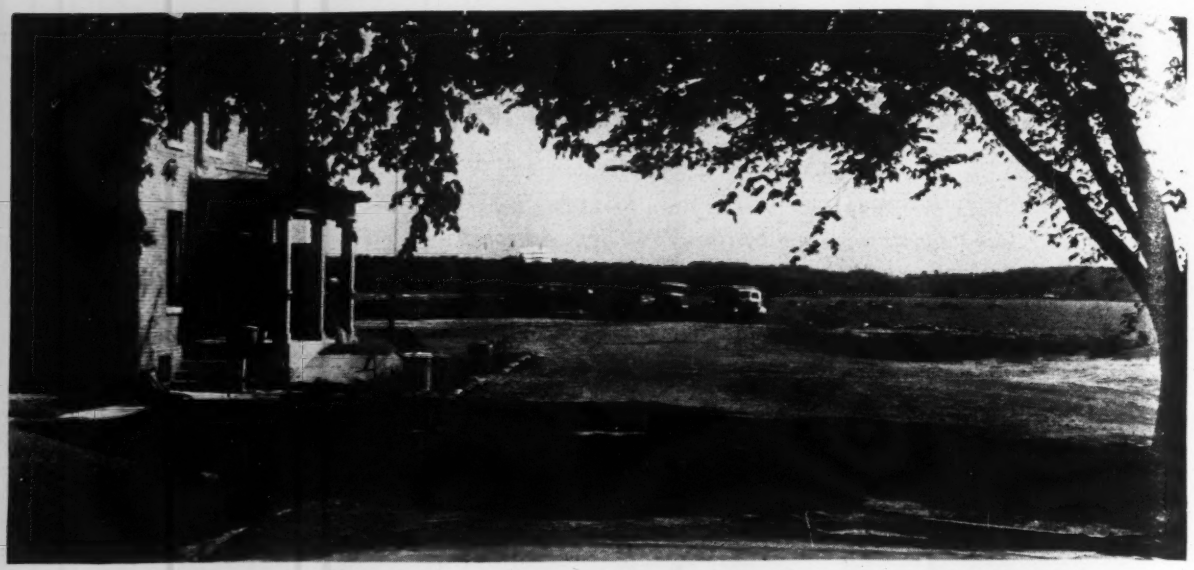


Fig. 2. Refuse landfill operations proceed in close proximity to residences on the Fort Totten reservation.

accrue in favor of landfill. This compares with a saving of almost $2,000,000 in 1940, when some 9,000,000 cu.yd. of waste was handled on fills.

In the four years ending this coming December a total of 43,000,000 cu.yd. of refuse will have been deposited in fills, as a result of which about 450 acres of swampy land have been improved. Some of this reclaimed land already has been developed into city parks.

Adjacent to Floyd Bennett field some 120 acres of swamp already has been filled. This filled land along with Floyd Bennett field has been turned to the Navy Department and is now under federal government jurisdiction. In the near future it is anticipated that extension of the airport will require the use of 110 acres of the filled area.

Fort Totten fill

The only filled land on which large permanent structures have been erected is at Fort Totten. Since 1937 the Department of Sanitation has filled in about 40 acres of salt marsh on this reservation at the invitation of Army officials. Two years ago when fort facilities were expanded, the army erected storage buildings and garages on 20 acres of this land. Supported by 25-ft. wood piles on top of which a 6-in. reinforced-concrete mat foundation is laid, the buildings are one-story brick structures. They are 60 by 200 ft. in size.

Present fill operations at Fort Totten, which is adjacent to Little Neck Bay on Long Island Sound, started in March and will elevate a 300 x 800-ft. area some 18 ft. above water level. This site is being prepared for an athletic field and recreational facilities. As soon as this is completed, work will be started on the reclamation of tidewater areas which will add 23 acres to the reservation.

At Fort Totten a typical example of a controlled fill operation is seen in which are exhibited all of the practices that have been proven best on the basis of long experience. The deposition area, for instance, is confined so that a front of not more than 60 ft. is open at any time. By confining operations to this relatively small strip the exposure of refuse is limited, bulldozer movements are concentrated to insure thorough compaction, and most important, the exposed areas can be covered each night using a minimum of earth.

As a result, the 1,000 to 1,200 cu.yd. of refuse deposited each day at Fort Totten are encased on both sides and top with earth, thus forming a "cell," which eliminates rat breeding, eliminates the possibility of spontaneous combustion, seals all odors and aids in the establishment of anaerobic decomposition to hasten disintegration of refuse and consequent

Fig. 3. Dumping operations are confined to a relatively narrow front on the fill so that the exposed area can be covered each night using a minimum of earth. A compound sprayed on the refuse at intervals during the summer months minimizes odors and eliminates flies.

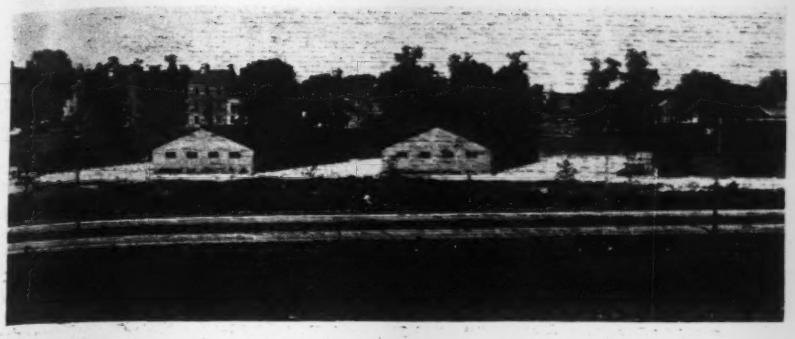


Fig. 4. Some of the garage and service buildings constructed on a refuse-filled land at Fort Totten.

settlement. Cover material is brought to the fill from outside the reservation, since no suitable earth is available at the fill site.

About three times a day, at equally spaced intervals, the deposited refuse is sprayed from a tank truck containing an emulsified solution of a chlorinated hydrocarbon compound. This application, which is made at the rate of about one gallon per cubic yard of refuse, minimizes odors and practically eliminates the presence of flies. The spraying is done only during warm-weather months of June, July, August and part of September. To eliminate the nuisance of flying paper, a wood snow fence barrier is placed several hundred feet to the leeward side of the dumping operations.

The Fort Totten fill is being made in two "lifts" of 12 ft. each in order to insure maximum compaction of the material. This is accomplished by first filling the entire area to a height of 12 ft., and then depositing on top of this another 12-ft. layer. Past experience indicates that a fill will settle about 20 percent in the first six months, after which there will be another shrinkage of some 10 percent in the next 18 months. Thus the present elevation of fill at 24 ft. will be reduced eventually by about 7 ft.

Public opinion reversed

Readers of this journal will recall the reports of protests registered against landfills in New York when the practice was first introduced. Citizen opposition in some parts of the city were so serious that grand jury indictments were returned against the commissioners of both sanitation and health for alleged maintenance of a nuisance. However, following the indorsement of the practice by a committee of public health experts, appointed by the U. S. Surgeon General, the court indictments were dropped.

Best index of the reversal of public opinion in the past few years is the number of requests for initiation of fills now received by the department from private interests owning submarginal tracts. A year ago last May the department accepted an invitation from owners of a 100-acre tract near the former World's Fair site and began filling operations. Known as the 98th St. fill in Queens, the property abuts the Horace Harding Boulevard. Because of its swampy nature this property has long been the source of serious mosquito breeding, and an expenditure of $150,000 has been made for mosquito abatement measures.

From 25,000 to 30,000 cu.yd. of refuse per week is being deposited on this site to raise the elevation 12 ft. There is relatively little good cover material to be obtained from these swamp bottoms and consequently some 100,000 yd. of earth cover is being brought to the site. This represents about 60 percent of the required cover material.

Research activities under way

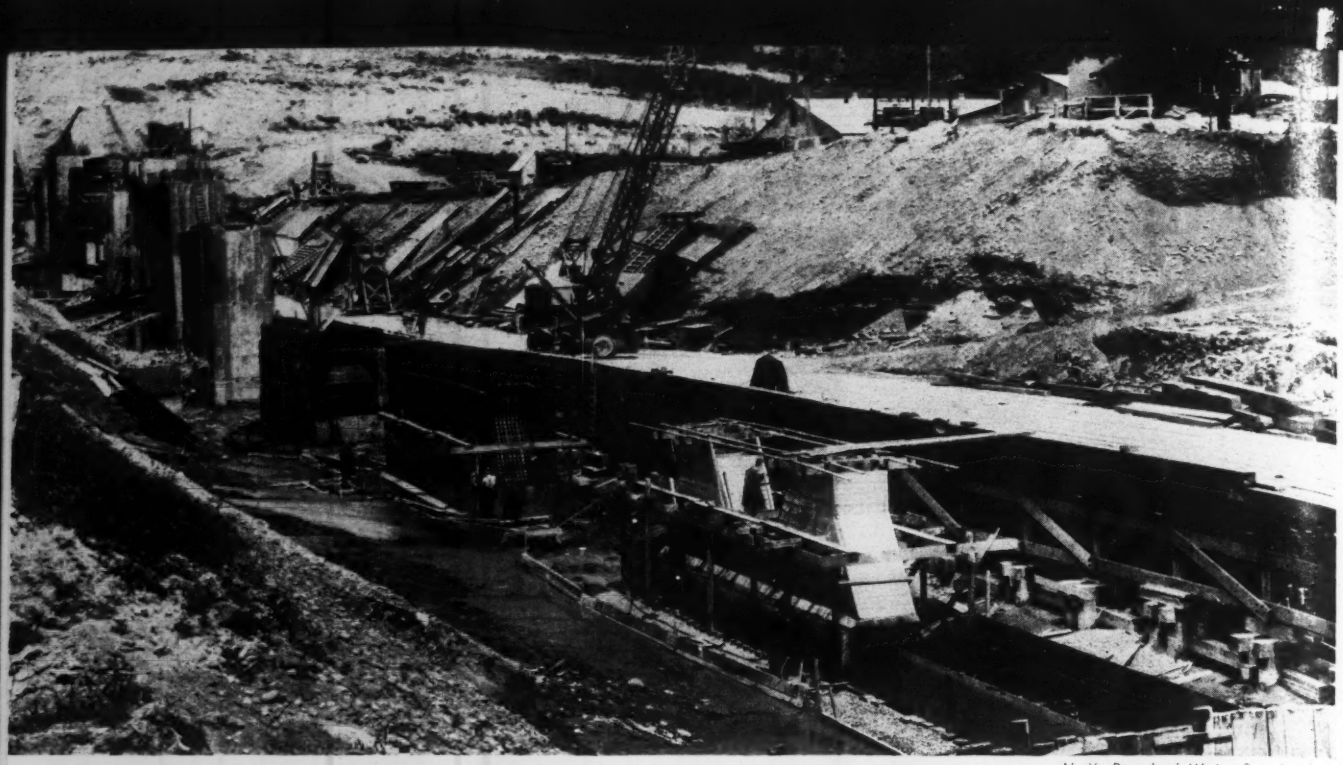
Landfill practice in New York City has been developed largely on an empirical basis. Because of the magnitude and growing importance of this method of disposal, the Department of Sanitation saw the desirability of initiating research work on a scientific basis. Accordingly, the department sponsored a WPA project under the direction of New York University and thus far two years of study have been completed. The work is nearing the stage where conclusions may soon be expected concerning the mechanism of decomposition, the effect of fills on structures and other pertinent data.

Meter Reading Practice

INFORMATION obtained from 47 United States cities with population between 80,000 and 220,000 as to 1940 meter reading costs and from 37 of the municipalities as to commercial department expenses was described by Kenneth K. King, director of water department, Kansas City, Mo., before the annual meeting of the American Water Works Association at Toronto, Ont.

The municipalities supplying data were divided into three classes, namely, northern, southern, and those cities reporting with combined utility operation of water and electricity or water and gas. Average commercial department expenses for the three groups vary little either in totals, per person, or per active service, but do differ greatly in average cost per bill. The average annual commercial expense per service for the 37 cities is $1.57, the northern group being 1 percent lower than the average and the southern group 6 percent higher. The average expense per bill is 22.7 cents, the northern cities being 78 percent higher, and the southern cities and those having combined utilities each being 26 percent lower than the average of all. The billing periods in the north are such that only about one-third as many bills are sent as in the other two groups, yet the total commercial department expense is nearly as high.

In compiling and comparing meter reading costs, no costs have been included except salaries of meter readers as well as they could be ascertained. The average cost per meter reading shows 4.4 cents as an average for 47 cities, with the cost for northern cities 73 percent higher, that for southern cities 43 percent lower, and the rate for cities of combined utilities 14 percent lower than the average. Salaries have no apparent relation to locality as far as north or south is concerned, the average monthly salary of meter readers is $130, the minimum $100, and the maximum $185.



N. Y. Board of Water Supply photo

Fig. 1. Construction of caissons for Merriman Dam cutoff wall on the Delaware Aqueduct.

Concrete Core Wall at Merriman Dam

***Contents in Brief**—Construction of a cutoff wall at Merriman Dam on New York City's Delaware Aqueduct has been successfully completed with twenty caissons, some as much as 180 ft. high, sunk to rock through boulders and water-bearing strata. The caissons are long, narrow boxes sunk as far as possible in free air and sealed under a maximum pressure of 38 lb. Steel forms were used for all work. Concrete was pumped to all parts of job, including placing under air pressure, from a centrally located mixer plant.*

TWENTY CONCRETE CAISSONS, mostly 12 x 45 ft., have been sunk through as much as 160 ft. of a complex assembly of glacial, waterborne and lake-deposited sands, gravels, boulders, silty clay and glacial till; the caissons have been sealed into solid rock; and the nominal 18-in. spaces between these caissons have been cleaned out and concreted solid to form the major part of the cutoff wall for Merriman Dam, a rolled earthfill storage structure on New York City's new Delaware water supply system.

Two of the twenty caissons were sunk in advance of the main work (*ENR*, Dec. 5, 1940, p. 761) to (1) test the practicability of the plan, (2) permit lowering of the groundwater by pumping and (3) determine the cost of sinking under the unusual local conditions, to assist contractors bidding on the rest of the construction. In addition to the caisson work, which crosses the deep overburden of the center of the valley, a solid concrete wall increases the height of the cutoff wall at the caissons and extends the full length of the dam. The caissons were sunk in free air as far as practicable, then, when water conditions demanded, compressed air was put on the boxes to permit continuation of the work.

PREVIOUSLY PUBLISHED ARTICLES ON THE DELAWARE AQUEDUCT

A Billion Gallons Not Enough	Apr. 11,	p. 513,	1940
Routing the Tunnel	Apr. 25,	p. 584,	1940
Designing the Aqueduct	May 9,	p. 656,	1940
Access to the Aqueduct	June 6,	p. 797,	1940
Controlling the Flow	July 18,	p. 109,	1940
Driving 85 Miles of Tunnel	Aug. 29,	p. 288,	1940
Tunnel Haulage and Hoisting	Sept. 26,	p. 419,	1940
Reservoirs and Dams	Nov. 21,	p. 688,	1940
Caissons for a Cutoff Wall	Dec. 5,	p. 761,	1940
Treatment for Delaware Water	Dec. 19,	p. 822,	1940
Passing Faults on the Aqueduct	July 31,	p. 150,	1941

Local aggregates were used for concrete, which was mixed in a central plant at the site and pumped to point of use.

The Delaware Water Supply System provides for supplying an additional 540 mgd. of water to New York City from watersheds on the west and southwest slopes of the Catskill Mountains through a continuous deep-level tunnel on which nearly all the excavation is now complete and the lining well under way. The water is to be collected in three reservoirs, the first being that formed by Merriman Dam. It will be about 200 ft. high above the original streambed, will have a crest length of 2,500 ft., a top width of 60 ft. and will require handling a total of 8,000,000 yd. of earth and 1,000,000 yd. of rock, including excavation. A 600-ft. waste weir with its crest 20 ft. below the top of the earth dam will discharge into a spillway channel cut in the solid rock of the hillside.

A 2,450-ft.-long diversion tunnel with a lined diameter of 30 ft. was driven through one of the abutments to handle streamflow during construction. It will be plugged near the inlet at the end of the construction period, and is so designed that

the permanent spillway channel will discharge through this tunnel using the same outlet works and stilling basin. The aqueduct intake, or Rondout effluent chamber, as it is officially known, is in a deep excavation in one of the abutments and feeds into the aqueduct through a tunnel on a 10-percent grade.

Design and assembly of the caissons

The two exploratory caissons for the cutoff wall were sunk from the bottom of a trench about 17 ft. deep but subsequent sinking was started from a trench about 38 ft. deep with 1 on 1.5 side slopes and a bottom width of 45 ft. Rolled fill starts from the bottom of this trench, thus permitting contact with the caissons and with a solid concrete wall extending about 60 ft. above the excavated trench, which brings it to 130 ft. or less below the reservoir water level. The rolled fill in the trench, and in the dam above it, is compacted with sheepsfoot rollers, using pneumatic or other hand-held power tampers along the caissons and cutoff wall as necessary.

The twenty caissons are similar in shape but vary in size; the two exploratory caissons (sunk in 1937-38) are 15 x 38 ft. in plan and 179 ft. 10 in. deep; nine of the caissons, in the deeper section, are 12 x 45 ft.; eight are 10 x 45 ft.; and one, between the exploratory caissons, is 12 x 38 ft. The caisson design suggested by the Board of Water Supply and detailed by the contractors, is shown in Fig. 3. Ends of each caisson are recessed 18 in., starting at 9 ft. above the cutting edge, to permit working room for cleaning and filling the area between caissons, especially in cases where they have drifted off line and closed up part or all of the 18-in. space allowed between boxes.

The caissons each have one man-shaft with one end circular to accommodate a 5-man elevator, and two muck shafts large enough to permit excavation with a clamshell bucket while working in free air. Keys were left in the muck shaft for later reduction to caisson bucket size when additional weight might be necessary to assist sinking.

Fourteen pipes were set to connect to the working chamber to provide the following services: one 3-in. for pump priming, one 3-in. for high-pressure air, two 6-in. for low air, one 6-in. blow-line, two 10-in. for concreting the seal, a 2-in. water line, a 2-in. power conduit, a 2-in. light conduit, a 1-in. telephone conduit, a 1-in. shooting conduit, and two $\frac{3}{4}$-in. whistle lines. As the work progressed two or more sets (nine 1-in. pipes each) of jet pipes were installed on each long side to assist sinking and were connected to the surface by two 2-in. risers for each set of jets.

The cutting edge was shop-fabricated and delivered to the job in four sections, then field-assembled in position at the bottom of the excavated trench. Wood forms were used for the 14-ft.-high working chamber but above it steel forms, for both outside and shaft forms, were utilized for a 15-ft. 6-in. lift. Outside steel forms consisted of 3 sections for each side and one piece at each end handled into position by crawler crane. Face metal was $\frac{3}{16}$ in. thick backed up by horizontal channels and vertical channel wales through which twelve $1\frac{1}{2}$-in. bolts passed to tie the form. The bolts were assisted by channel ties at the top of the form and combination wales and ties on the end panels. The shaft forms were collapsible and self-supporting so that no ties or loose blocking were required. They were held in position at the bottom by previously placed concrete and at the top by the channels holding the outside form.

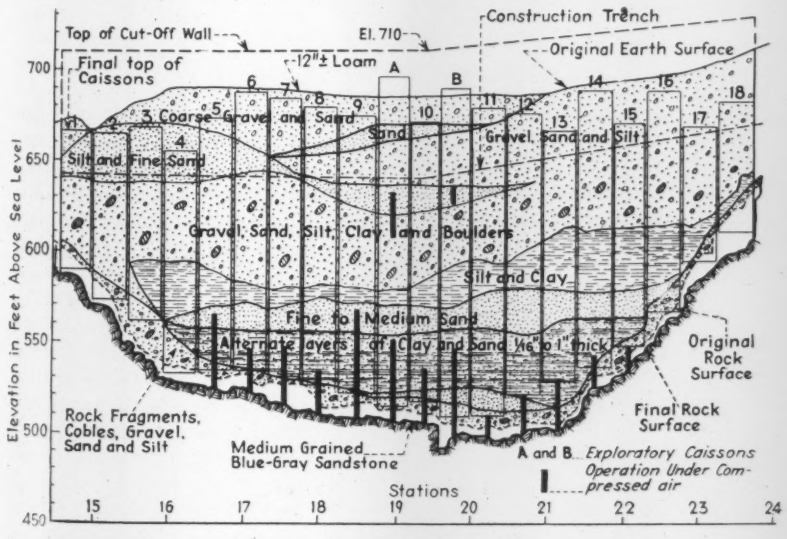


*Fig. 2. **Materials encountered in caisson sinking.***

The concreting set-up

Concrete contained 2 bbl. of cement per cu. yd., and was proportioned dry-rodded as 1:1.40:2.66, with the same weight of $\frac{1}{4}$-$\frac{3}{4}$-in. and $\frac{3}{4}$-$1\frac{1}{2}$ in. aggregates being used for the most of the work. Average slump was 3.7 in. and average 28-day strength was 5,794 psi.

A central plant placed about the center of the concrete wall and just upstream from it filled all concrete requirements. Aggregate, trucked from the contractor's crushing and screening plant, at a nearby gravel pit, was dumped on a 24-in. belt conveyor for transportation to the top of a 4-compartment 200-yd. bin. Cement in bulk, trucked from a rail connection, reached the same bin via a bucket elevator.

Weigh batchers under the bins proportioned material for two 1-yd. non-tilt mixers which fed into a double-cylinder concrete pump that forced concrete a maximum of about 800 ft. horizontally and 50 ft. vertically. Generally, the concrete was pumped into a multiple-discharge hopper, which directed the concrete through chutes and elephant trunk spouts to point of placement, average rate of placing being about 50 yd. per hr. The concrete pipeline was supported from the ground or on previously placed concrete, never on the forms. Curing was done with an emulsified asphalt sprayed on the concrete immediately after the forms were stripped.

Excavation and sinking

A 30-ft.-wide work platform was built along one side of the caissons. It consisted of a 12 x 12-in. timber deck on steel beams, at 10-ft. centers, supported on timber bents set on mud-sills. Provision was made for jacking up the bents and leveling as this might be required when lost

ground, due to excavation, caused settlement. Utility lines were carried under the work runway. All operations of excavation and form moving were handled by cranes moving easily on this runway.

Alternate caissons were first started with the intermediates following from two weeks to two months later as construction conditions warranted. Excavation was done by crane and clamshell bucket, a "funnel" of sheet steel about 4 ft. high being set over each muck shaft opening to facilitate aligning the bucket. General procedure was to dig through one muck shaft with the muckers at the other end of the working chamber, material being loaded directly on trucks for disposal. After the clamshell had excavated below the general level of the cutting edge at one shaft both the clamshell and the muckers changed ends, the muckers shoveling the earth from along the cutting edge into a pile under the vacant shaft. Clay spades about 3 in. wide and slightly curved were used on pneumatic hammers to assist excavation.

During most of the construction period three shifts a day were worked six days a week on each of two caissons. A typical gang consisted of a foreman and eight muckers in the working chamber and a crane operator, oiler and signal man on top supplemented by truckers, mechanics and electricians as required.

Fig. 2 shows the material encountered in sinking and the distance it was necessary to work under pneumatic pressure. This amounted to only 14.7 percent of the total linear feet exclusive of the exploratory caissons. Maximum water pressure encountered in exploratory drilling was 80 psi., but pumping in the exploratory caissons reduced the groundwater level to a point that maximum pressure necessary in excavation was 26 lb. and for sealing the boxes was 38 lb. with six of the caissons sealed in free air, three at 18 lb. or less, three at 18 to 26 lb. and five at 26 to 33 psi.

All but one of the 18 caissons, following the exploratory caissons, were concreted to the full height before air locks were installed. The height of the caissons above the excavated trench varied from 4 ft. to 45 ft., partially determined by the weight necessary to overcome friction. It will be noted that some of the caissons "hung up" several feet above the decomposed rock surface but they were

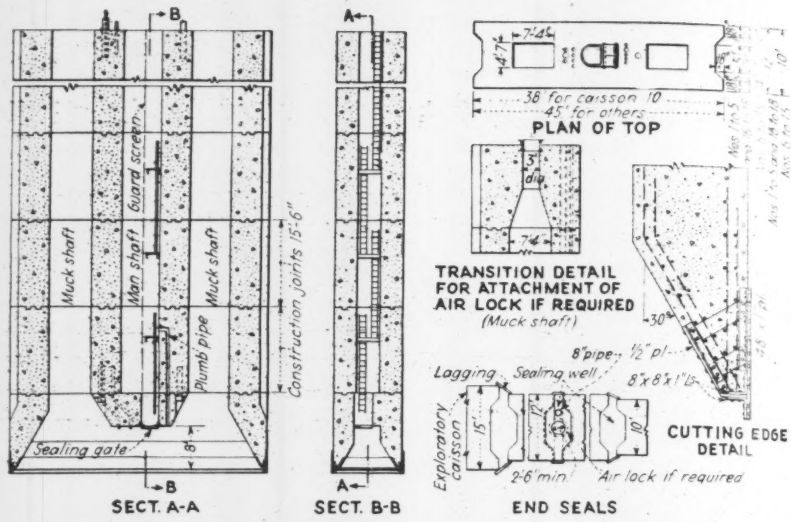


Fig. 3. Caisson design used for the cutoff wall.

in sufficiently good material to permit excavation and underpinning to the solid rock.

Sinking generally proceeded smoothly, an average rate of 37.7 ft. per week being maintained for the 2,072 ft. of caisson sunk or underpinned from the setting of the first caisson shoe on Jan. 2, 1940, to the sealing of the last box on Jan. 23, 1941. Generally, two gangs worked on each of three shifts. Normally, the caissons followed the excavation down with assistance from air or water jets in the concrete walls, by blowing and by shooting light charges of dynamite about six feet outside the cutting edge. However, three of the boxes, Nos. 9, 14 and 16, gave unusual trouble. The cutting edge was entirely exposed, jets were used freely, the muck shafts were filled up to the minimum size which would permit the passage of a concrete bucket, up to 500 tons of pig iron was loaded on the top and in one case, charges of explosives were detonated at a depth of 35 ft. around the caisson, all without success. Movement was achieved by clamshell excavation on one or both sides of the caissons to depths ranging from 13 to 39 ft. before the boxes started to move, with an estimated friction figure of 1,740 lb. per sq. ft. on one of the caissons.

Compressed air work

Preparations were made for putting air on each of the caissons as experience with the borings and exploratory caissons indicated it was necessary. The air plant consisted of two high-pressure compressors, each rated at 1,300 cfm., two 50-lb. maximum pressure compressors of 5,400-cfm. capacity, all electrically powered, and a gasoline-driven, 600-cfm., 100-lb.-pressure portable unit for possible emergency.

One vertical man-lock (seating capacity 24 in two tiers) and two muck locks were used on each box. Attachment to the caisson was made generally by permanently concreting in a pipe section, but in some cases a temporary connection was made so that the pneumatic equipment could be removed to permit the full shaft opening to be used for further clamshell excavation.

Workers went under air as rapidly as they could lock in. Decompression time was held to one minute per pound of pressure. A 5-man elevator, operated first by pushbuttons on the cage and landings but changed, as a safety measure, to push-button control of signals to an operator on top of the man shaft, carried the men into and out of the working chamber whenever the depth exceeded 60 ft. in either free or pressure air. Hoisting was done with an electric hoist equipped with an automatic solenoid brake and a manually-controlled emergency brake. Muck hoisting, after air was put on, was done first by air hoists set on the bank but mostly by tugger hoists supported on the muck lock.

No pump chamber was provided in the caisson, the necessary pumping being done by electric-driven, deep-well turbine pumps with a 6-in. discharge line lowered through one of

the 10-in.-dia. pipes left for concreting the seal. The pumps used had a rated capacity of 300 gpm. at 200-ft. head, one per caisson being more than ample to handle any water encountered.

Underpinning

The final positions of the cutting edges are shown in Fig. 2. On the sides of the valley one end of the box generally reached the rock surface while the opposite end was still far above it, necessitating some underpinning. Where good rock was in contact with the cutting edge the excavation was stepped in to let the ledge carry the load. Where the rock was poor or earth was encountered, it was excavated full width of the cutting edge (for earth, 6-in. wider, with poling boards used to hold it), and underpinning walls poured with concrete, leaving an opening about 8 ft. wide between the walls for the final seal.

The small volume of concrete used for underpinning and reducing the muck shaft opening was trucked from the mixers and lowered into the caissons. Concrete placing for the seals was accomplished by connecting the pump line to one of the 10-in. pipes imbedded in the caisson. No locking device was necessary as the pump readily forced the concrete in against the back pressure of the air. The only special equipment used was a gate valve in the pipe at the top of the caisson and flap valves on an inverted Y-connection at the bottom. The flap valves automatically prevented air escaping from the box when pumping halted.

Concreting of the seals was done as soon as good foundation rock was uncovered and cleaned. In some cases the seal was bulkheaded back from the intersection with the adjacent boxes until the connection between could be prepared for concreting.

Grouting

Grout pipes were placed to project through the underpinning walls and brought up inside the working chamber to fill possible voids along the outside of the caisson. Diamond drill holes were also put down along the axis of the dam to a depth of 20 ft. at 10-ft. intervals, with additional holes 60 to 100 ft. deep at 100-ft. intervals. In free air these holes were drilled prior to placing the seal

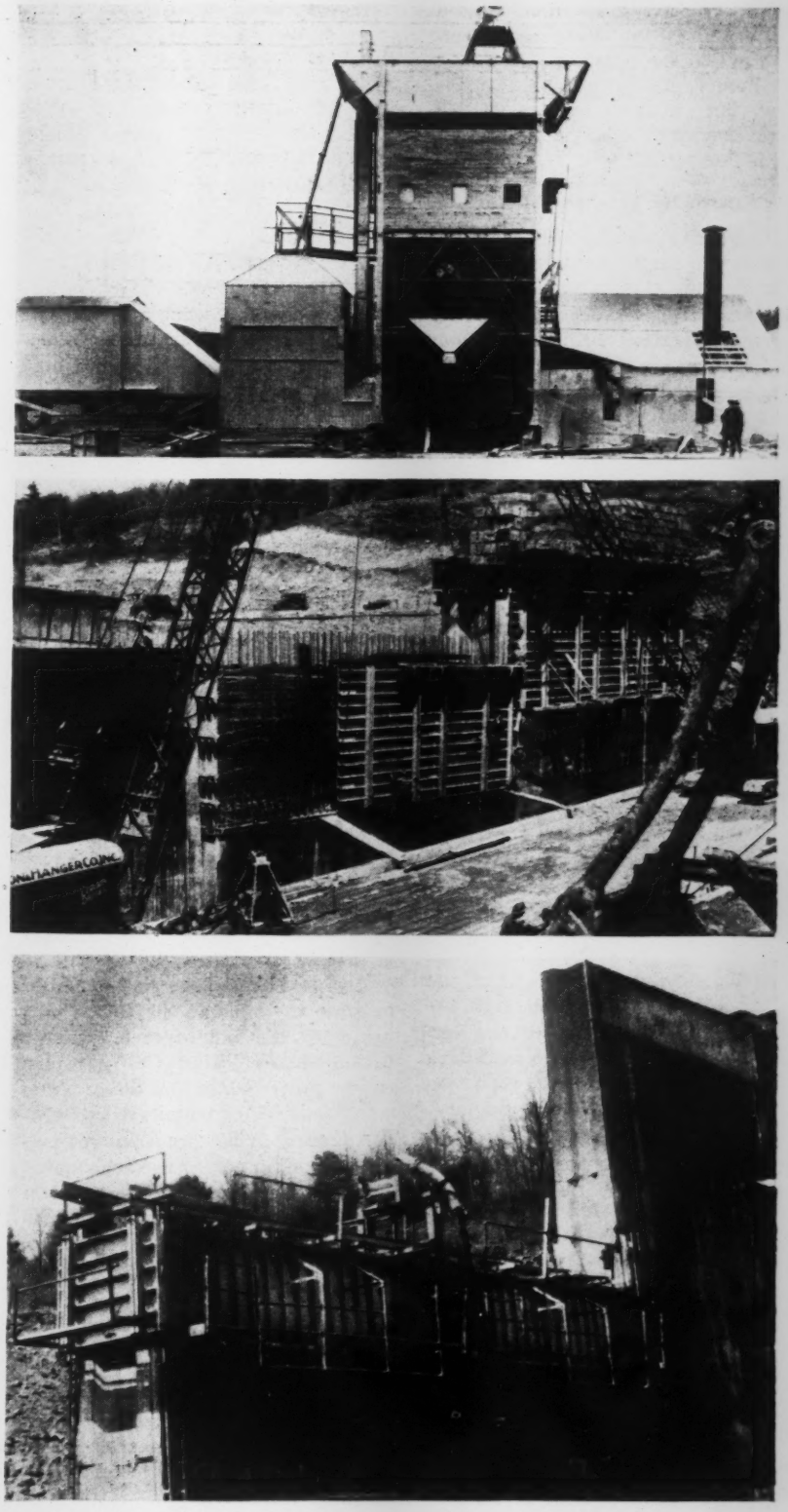


Fig. 4. (Top) Concrete plant during assembly. Note turnhead from belt delivery at top, two 1-yd. non-tilting mixers and concrete pump. (Center) At right, Caisson 16 loaded with 500 tons of pig iron. At left, steel forms being erected for 15 ft. 6 in. lift. (Bottom) Self-lifting form for solid wall above caisson were used where wall extended above the reach of the lifting equipment. The concrete pump discharge line is supported by the previously placed concrete.

course but where air was required drilling was done through 2½-in. casings left in the concrete seal. Across the floor of the valley holes are vertical, but along the slopes of each bank they are drilled at 22½ degrees from the vertical.

Connection between caissons

The seal along the bottom of the trench was made continuous by cutting through the interstices between the boxes from the adjacent working chambers (except between Caissons A and 9 where there was 17 ft. between boxes due to drift in sinking). The usual procedure was to drive horizontal poling boards, cantilevered over a steel or timber beam supported in recesses left in the underpinning walls. When they reached the adjacent box, a steel beam supported on dowels drilled into the caisson was set to carry the ends of the poling boards and excavation was carried to sound rock under this roof support.

Excavation of the interstices was done from the top with timber breast walls set across the opening between caissons as removal of the material made it possible. Concreting followed relatively close behind the excavation, the joint being filled except for a 36-in.-dia. shaft opening left to permit passage of men, material and 6 service pipes.

Pressure air, to a maximum of 42 lb., was required on some of the interstices to keep water out of the working area. Only a muck lock was installed, set directly over the vertical opening, and used for both men and material. Workmen rode the bucket in and out and transferred, through free-air, to a decompression lock nearby.

Concreting under pressure was done by connecting the concrete pump to an 8-in. pipe embedded in the previously placed concrete.

Solid wall above caissons

Above the caissons, and continuing each way from them, a solid concrete wall forms additional cutoff against which the rolled fill of the dam will be placed. On one bank the material was such that open-cut excavation permitted carrying the wall down to rock with only a small amount of open cofferdam required. Overburden and water on the other bank required a heavy sheetpile cofferdam for most of its length. Across the center of the valley the solid wall extends 15 to 55 ft. above the caissons as required to bring the wall to design height.

The solid wall was formed with an ingenious sliding steel form that lifted itself with hand winches. While the ties held the main panels to the previously placed concrete, the winches raised a steel frame, and then the frame bolted in new position, was used to lift the panels. This self-lifting feature was especially advantageous as the walls extended beyond the reach of cranes or other lifting equipment on the dam. Final stripping and removal of the forms was done by lowering the heavier panels from the frame, then dismantling the frame and lowering it with hand lines.

Construction of Merriman Dam is being done by Mason & Hanger Co., Inc., of New York City, under a $15,486,000 contract which includes shaft 1 and about 8,300 ft. of aqueduct tunnel. For Mason & Hanger, G. W. Sackett is manager, John M. Pibble resident engineer, William B. Ury general superintendent and Harry F. Stripling, caisson superintendent.

The Board of Water Supply is represented by James A. Guthridge, watershed department engineer, N. LeRoy Hammond, Lackawack division engineer, Chas. G. Hoerner, senior section engineer, and Herbert A. Dibbell, section engineer in immediate charge of Merriman Dam.

Placing of rolled fill for the completion of Merriman Dam is now underway with most of the material coming from shallow borrowpits in the reservoir area. George M. Brewster & Son, Inc., is subcontractor.

Long-Range Improvement Program Prepared for Maryland

A CAPITAL IMPROVEMENT program which "should live and move with the times" has been adopted by the Maryland state planning commission, reports the American Public Works Association. The program for expanding the state's facilities and buildings is to cover six years, but it will be subject to biennial revision, in order to meet any changes the future may bring. At the end of each two-year period, an additional two-year plan will be projected, so that the program actually becomes perpetual.

Adoption of the program was preceded by a joint study by the planning commission and the state department of budget and procurement, with technical assistance of the National Resources Planning Board. In the study individual project forms were distributed to each subdivision of the 23 departments and institutions of the state. The various divisions of the departments listed and described every capital outlay project desired or required within the next six years on special forms. Full engineering data and information on priorities of the projects also appeared on the forms, indicating such facts as whether land had been acquired for buildings and whether existing utilities would be sufficient.

When completed, these individual forms were submitted to the department heads, who reviewed them, made revisions they considered necessary, and then compiled them into a comprehensive department program, which was finally judged by the planning and the budget agencies.

Maryland was the first state to embark upon a long-term development program for major state improvements, according to the association. The Maryland state planning act, passed in 1933, directed such a capital improvement planning program, and in 1939 another act was passed which established the department of budget and procurement, whose duty it is continuously to study and analyze the needs of all agencies receiving state funds.

The six-year program will not necessarily stimulate construction, Maryland planning officials pointed out, since in many cases "it may well act as a brake on too hasty undertakings with their accompanying annual burden of operating expense." In some instances, for example, the improvements planned may be delayed until the post-defense period, in line with recommendations of public works, finance and planning authorities throughout the country that a "reservoir" be built up for employment-creating purposes.

Drilled-in Caissons with Heavy H-Cores Carry 16-Story Navy Warehouse

Charles B. Spencer
Vice President
Spencer, White & Prentis, Inc., New York City

***Contents in Brief**—Thirty-inch-diameter open-end pipe shells 1/2 in. thick were driven as much as 140 ft. to rock, 29-in.-dia. sockets drilled into the bedrock, and structural steel H-cores up to 466 lb. per lin. ft. concreted in to carry up to a 1,275-ton column load on a single caisson for a 16-story warehouse at the Brooklyn Navy Yard. Here one of the contractors, working for the first time with the drilled-in caissons, describes the work and give his opinion on the merit of the method used.*

THE WRITER has been an engineer and contractor specializing in foundation work for nearly 30 years, and can state without exaggeration that the foundation work for the 16-story warehouse, No. 77, at the Brooklyn Navy Yard, is the most difficult foundation in his experience. The underlying material is such as to require foundations bearing on rock for the support of the heavy structure. The depth to rock is so great and the intervening material of such questionable stability that it required special methods to reach bedrock.

Test borings indicated fill material to a depth of 20 ft., followed by about 5 ft. of peat and silt, then sand and gravel to a depth of 75 ft. and finally clay to near the rock surface at a depth of 140 ft. In some cases the rock was overlain by water-bearing sand, gravel and boulders. The upper sand stratum varied greatly in thickness, extending in some cases nearly to rock. The site of the warehouse adjoins a similar building built in 1918, founded on concrete piles driven into the sand, which has undergone a considerable differential settlement. To supplement the borings: (1) an open-ended 24-in.-dia. steel tube, for subsequent filling as a pile, was driven substantially to rock and (2) a 30-in.-dia. steel shell was put down by the drilled-in caisson process and socketed approximately 22 ft. into the rock ledge. The writer, who at the time had no official connection with the project, was asked to inspect the test piles and to express an opinion as to the relative merits of the various types of foundations possible and to make an approximate estimate of the cost of each. Several methods of supporting the structure were considered, outlined briefly as follows:

(a) Steel H-section bearing piles computed for 65 tons load each, which is the maximum permitted by the Building Code of the City of New York;

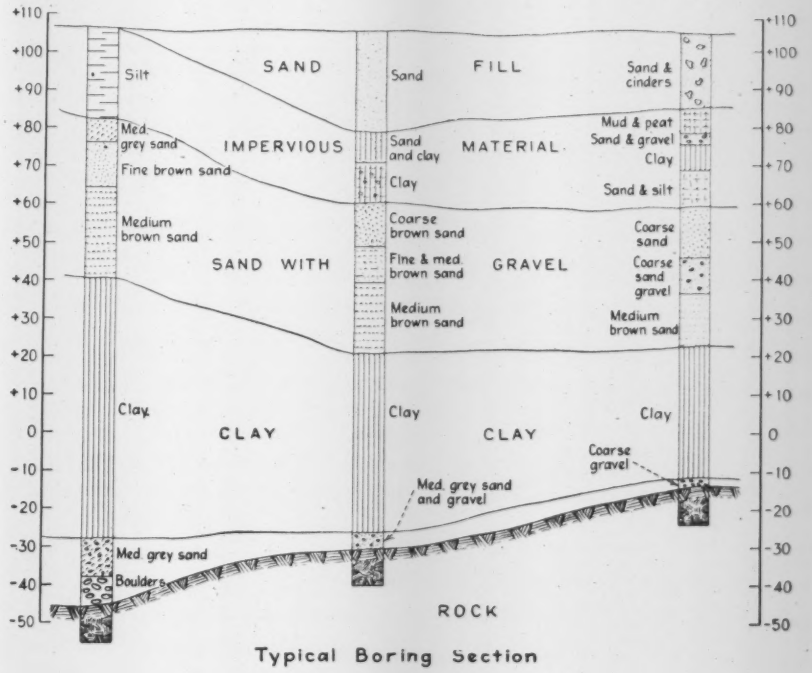
(b) 20-in. x ½-in. concrete-filled steel tubes, at the Building Code loading of 154 tons each;

(c) Caissons consisting of 5-ft.-dia. shells sunk to rock by pneumatic methods and filled with concrete;

(d) 30-in.-dia. drilled-in caissons, socketed into the rock and provided with H-section cores as hereinafter described.

Concrete piles were not considered as they would have to bottom in sand at a sufficient distance above the clay to allow the loading to be uniformly distributed into that material and the extreme variation in the elevation of the sand stratum seemed to render impracticable any uniformity of loading conditions in the clay.

An average bearing pile pier consisting of 14-in. 89-lb. beams driven



Typical boring section. Boulders were encountered in the sand-gravel strata but were not indicated by the advance exploration.

to rock was estimated at $9,500, including the reinforced-concrete capping. A similar pier of concrete-filled steel tubes driven to rock was valued at $11,000, including the cap plates and reinforced-concrete capping. Either method involved the risk that many of the units would not reach rock but would bottom in the overlying boulders.

Despite the great depths, which apparently exceeded the legal limits of compressed air work, pneumatic caissons could be used, since the water table, originally at about 10 ft. below the surface, had been lowered approximately 50 ft., by continuous pumping of industrial wells in the vicinity over a long period. It was estimated that an average pneumatic caisson of the required depth would cost $12,000.

Cost estimates

Based upon the 180 foundation piers contemplated, the complete foundation by the various methods was estimated to cost as follows:

(a) Bearing piles	$1,700,000
(b) 20-in. open-ended steel tubes	2,000,000
(c) Pneumatic caissons	2,200,000
(d) 30-in. drilled-in caissons	1,250,000

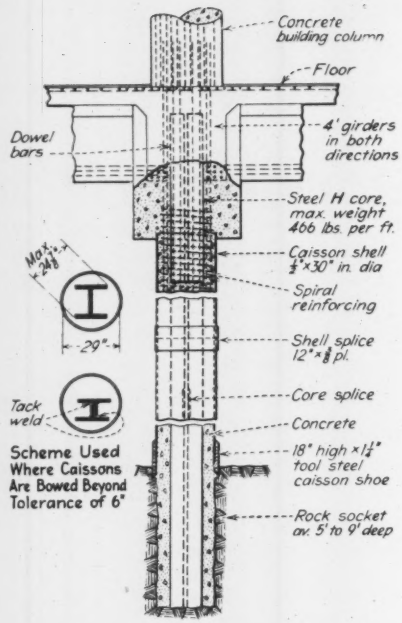
The estimate for the drilled-in caisson was made by the Western Concrete Pile Corp. and this method was specified in bids taken by the general contractor for the building. The writer, who had observed the installation of the test caisson, had been greatly impressed with the process and, previous to the award, had agreed to assume a half interest in a contract for his company, Spencer, White & Prentis, Inc. The contract for the foundation work was awarded to the combination under the name of Western Concrete Pile Corporation.

The design called for 180 caissons, spaced at approximately 20 ft. center to center both ways, covering a plot 183 x 343 ft. Based upon the boring and test pile information, the depth to rock varied from 123 to 151 ft. below the surface, about 24,000 lin. ft. of caissons was anticipated.

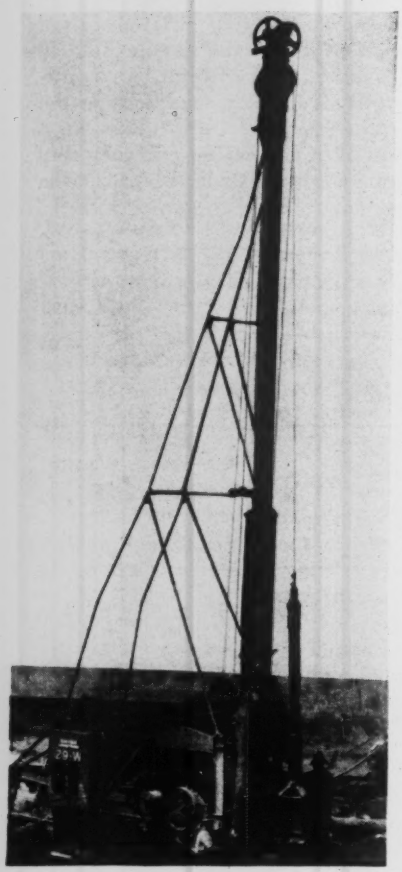
Drilled-in caissons

Each caisson consists of a 30-in.-dia. shell of spiral-welded pipe, ½ in. thick, provided at its bottom with a steel driving shoe so as to provide a powerfully reinforced cutting edge. The shell was driven to rock, the material removed from within, and a 29-in.-dia. socket drilled into the rock to an average depth of 6 ft. by means of cable tools operating inside the shell. A steel H-section core, the weight of which varied with the column load, was set into the rock socket, extended to the surface, and was connected to the building column above. The space between the core and the shell was filled with 4,000 psi. concrete continuous from the bottom to the surface. In reality, the drilled-in caisson process actually extends the concrete building column to and into the rock by means of vertical and spiral reinforcing at the top of the steel core.

A single caisson was provided for the support of each column, the column loads varying from 500 to 1,275 tons. While it is customary to design such caissons using standard working loads on the steel core, con-

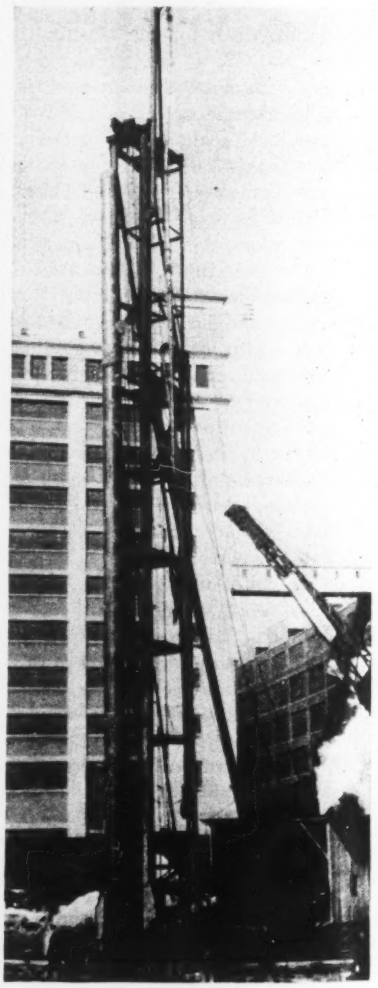

Concrete building column
Floor
4' girders in both directions
Dowel bars
Steel H core, max. weight 466 lbs. per ft.
Caisson shell ¼"x30" in. dia
Spiral reinforcing
Max. 24"
29"
Shell splice 12"x⅜ pl.
Tack weld
Core splice
Concrete
18" high x 1¼" tool steel caisson shoe
Rock socket av. 5' to 9' deep
Scheme Used Where Caissons Are Bowed Beyond Tolerance of 6"

Typical drilled-in caisson



Drill rig, drill and bailer. The drill in use weighs 3,000 lb. Drills up to 4,500 lb. were used on the nominally rated 3,000 lb. machine.

Piledriver leads 90 ft. long were required to start a 70-ft.-long, 30-in.-dia. spiral-welded steel shell.



crete and shell, the Bureau of Yards and Docks' design discounted the steel shell. The core was figured at 14,000 psi. and the gross area of the caisson at 1,200 psi. The average column load is about 1,020 tons and is supported on a caisson provided with a nominal 14-in. wide flange core, weighing about 300 lb. per lin. ft.

Conservative design

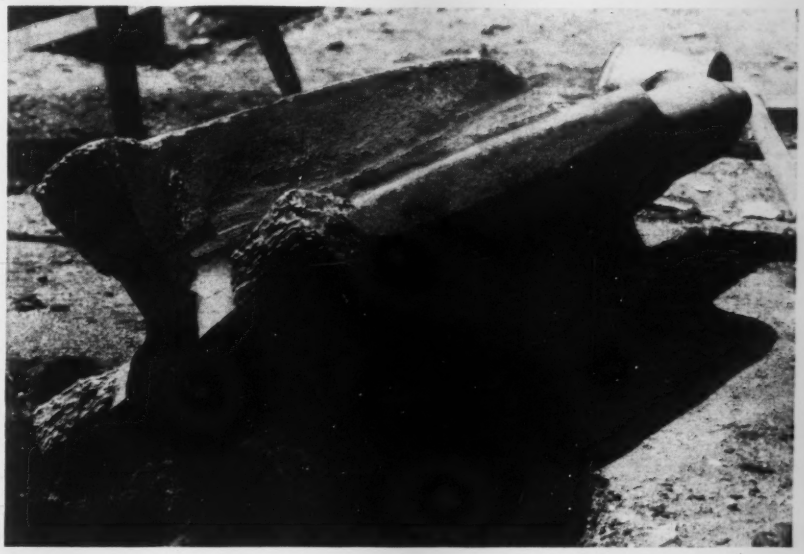
It will be noted that if the entire column load is considered as carried by the core, the unit load on the steel acting in compression, and completely supported by the concrete and the shell is only 23,000 psi. At 43,000 psi., the shell alone, which had an average yield point of 45,000 psi., would figure to carry the entire load, while the entire caisson figured as a concrete shaft would carry the entire load at 2,900 psi. of its cross-section. The specifications called for a 4,000-lb. concrete so the design appears quite conservative.

The purpose of the socket in the rock is twofold. Obviously the anchoring of the caisson into the rock insures against lateral movement, and provides, in effect, a "fixed-end" column. Further, due to the comparatively small diameter of the caisson, additional bearing on the rock must be provided to meet the requirements of standard rock loading practice. The socket serves this purpose since it has been established by actual test that the bond between the concrete and the sides of the socket is in excess of 400 psi. In the case of this building, the loading on the rock at the bottom of the socket was figured at 1,200 psi. and the bond on its sides at 200 psi. These figures gave socket depths varying from 5 to 9 ft.

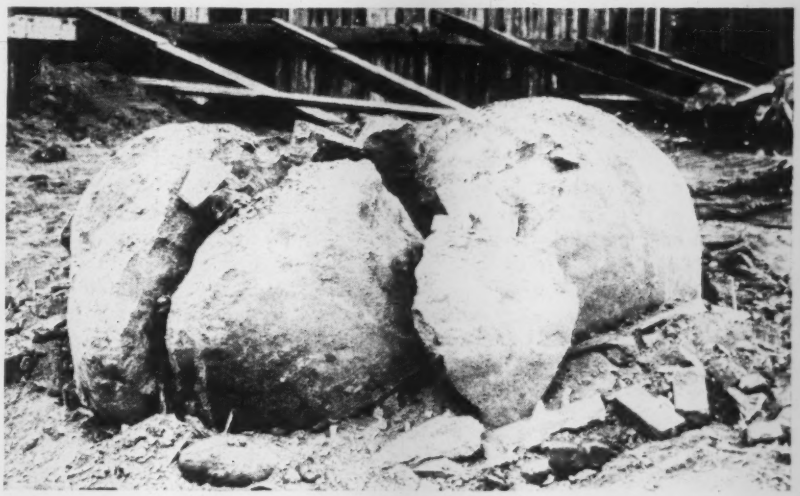
Driving the shell

Three piledriving rigs with steam hammers, were used to drive the 30-in.-dia. shells, which came to the job in 70-ft. lengths. The shells were set in wood frames placed a few feet in the ground and the top supported in 90-ft. piledriver leads. Extreme care was used in starting the cylinders plumb, and their plumbness was checked during the driving of the first 70 ft. by use of two transits. As additional lengths of cylinder were required, they were plumbed above the first section and attached by welding.

As might be expected, the penetration through boulder strata presented the greatest difficulties. The borings showed only occasional boulders, while as a matter of fact approximately two-thirds of the caissons struck boulders of sufficient size to present serious difficulties. When a large boulder was encountered a heavy drill bit, operated by the piledriver hoist, was usually sufficient to break it into pieces smaller than 8-in. dia. The broken pieces were removed by means of a bailing bucket consisting of a piston inside a 20-in.-dia. cylinder. The cylinder was lowered to contact with the material to be removed, and a fast upstroke of the piston pulled the material into the cylinder. The closing of a flap valve at the bottom held the material while raising to the surface.



Heavy bit used in drilling sockets into the rock



Boulders similar to the one shown (after it had been blasted for removal from adjacent excavation) were encountered and successfully penetrated.

In some cases it was feasible to drive the first 70-ft. length of caisson without cleaning. When this was impossible resistance was relieved by means of water jets operated from the piledriver leads. Jetting was done with water furnished from the Navy Yard salt water mains, jets of 4-in. dia. with 1-in. nozzle being used at a pressure of 250 psi.

When the steel shell reached rock, there usually remained about 60 ft. of material within the cylinder. The driver moved on to the next location, and the shell was cleaned by a churn drill rig. Passing the heavy clay material required churning with the drill tools to loosen the material for removal. The churn drill rigs, after cleaning the shell to rock, drilled the

Job substantially completed. Longitudinal and spiral reinforcing cage shown is designed to transmit column load into caisson.

sockets to the specified depths.

After the first 2 ft. of drilling into the rock, a driving hammer was put on the 30-in. shell by a steam crane and it was driven on down to reach a seat in the rock. In previous operations, in rock of normal hardness, it has always been found practicable to drive the shell into the rock a sufficient depth to provide a watertight seal. At this site, however, the hardness of the ledge was such that the redriving broke off the rock irregularly, so that when water-bearing material overlay the ledge, a watertight seal could not be obtained, though the flow of sand could always be stopped. It was possible to unwater and visually inspect about one-third of the sockets full depth into the rock while the remainder were inspected to the bottom of the shell after the socket had been sealed off with grout. Inspection was accomplished by lowering a man into the caisson in an open cage.

Cores up to 466 lb. per ft.

Structural steel cores, mostly nominal 14-in. wide flange sections, of unusual weight, were used to carry the heavy column load into the rock sockets. Largest sections were actually 18.50 by 16.64 in., weighing 412 lb. per ft. and built up by addition of two ¾-in. by 10-in. plates to a weight of 466 lb. per ft. All steel sections were shipped to the job in 50-ft. lengths, or shorter as required to complete a hole, the ends being milled for bearing at splices.

The first operation in core setting was lowering 2 yd. of grout in a single-line, bottom-dump cylindrical bucket of 24-in. dia. This grout filled the socket and extended up to a point about 5 ft. above the cutting edge of the caisson. The first core section was then lowered into the caisson and suspended from the top of the shell by means of clamps, while the second section was connected to it by welded web and flange splice plates. The double section was then lowered and similarly suspended while the third section was attached. The completed core was carefully lowered through the grout to the bottom of the socket. The installation of the core required originally about two hours and was reduced to about 45 min. at the conclusion of the work.

The boulders encountered, in many cases over 6 ft. in dia., resulted in damage to eight original caissons and required the installation of thirteen additional units. In some cases the original caisson shell was jacked out and another caisson installed at the same location. Elsewhere, the additional caisson was installed alongside the original location and a steel girder extending to the adjoining column was provided to transmit the load.

Occasionally, hard driving through boulder nests bowed the caisson shells beyond the 6-in. permitted. In order to install the H-core without inducing a bow in it, it became neceessary to cut the core down the center line of the web making thereby two tees. These tees were then welded together with webs lapping, reducing the cut to out of flange dimensions enough to allow installation without bowing.

The top of the caissons were provided with heavy dowel rods and spiral reinforcing to form the connection with the concrete columns above. The cylinder caps were interconnected by reinforced-concrete girders in both directions. These girders supported the ground floor system independently of the soil, which was considered inadequate to support a floor load.

The writer, who had no previous experience with drilled-in caissons, feels that in this case they accomplished the solution of an almost impossible problem. In the light of actual experience on the work it is probable that only the pneumatic caissons would have afforded comparable results. It is certain that neither concrete-filled steel tubes nor bearing piles would have reached rock except in isolated cases. It is also certain that the presence of large boulders would have nearly doubled the cost if pneumatic caissons had been used. The time lost in the removal of such obstructions under compressed air would have run into many months.

Personnel

The foundation was designed by the Navy Department, Bureau of Yards and Docks, Washington, D. C., Rear Admiral Ben Moreell, chief. F. R. Harris, Inc., of New York City, were consultants on the design under the direction of Rear Admiral A. L. Parsons (CEC), USN, retired.

Commander W. H. Smith (CEC), USN, Public Works Officer of the Brooklyn Navy Yard, assisted by Lt.-Comdr. F. A. Rossell (CEC), USNR, had charge of the installation for the Bureau of Yards & Docks.

General contract for erection of General Storehouse No. 77 is held by the Turner Construction Co., Inc., of New York City, who are represented at the job by Carl Fritch, project engineer, and Walter Conlin, project superintendent. The drilled-in caissons were installed by the Western Concrete Pile Corp., under the personal supervision of J. H. Thornley, president, who holds letters of patent for the process. The job superintendent was C. W. Franc, assisted by G. F. Flay, Jr., and H. A. Armstrong, of Spencer, White & Prentis, Inc.

Pneumatically Placed Concrete for Walls of Industrial Plants

BUILDING DESIGNERS' LIBRARY

J. Q. A. Greene
Vice President
Gunite Concrete & Construction Co.
Kansas City, Mo.

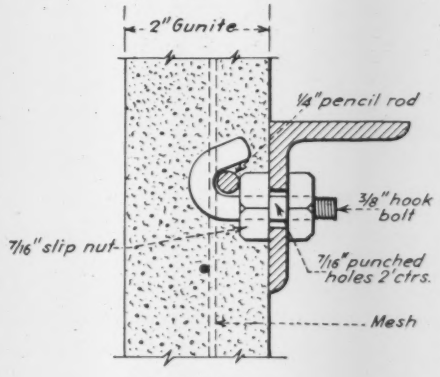
WALLS FOR INDUSTRIAL BUILDINGS are important elements of defense structures, both as to cost and the time required for construction, and one of the modern materials used for the exteriors of many outstanding plants of the national defense program is pneumatically placed cement mortar, or shotcrete. This type of wall design has been used in the Curtiss-Wright Corporation plant at Buffalo, N. Y., the General Motors plant at Melrose Park, and for two large additions to the Glenn L. Martin plant at Baltimore. The U. S. Army has also used this type of wall for the Air Corps warehouse at Barksdale Field at Shreveport, La. The following paragraphs review the general features of design and construction for this type of wall when used in single-story steel frame industrial buildings.

Columns along the walls of industrial buildings vary considerably in spacing with 16 ft. as a commonly used interval. These columns are most frequently steel H-sections with the flange sides running parallel to the direction of the wall. These steel columns support the roof system of steel truss and purlin design. A typical section through this type of wall is indicated in the accompanying drawing.

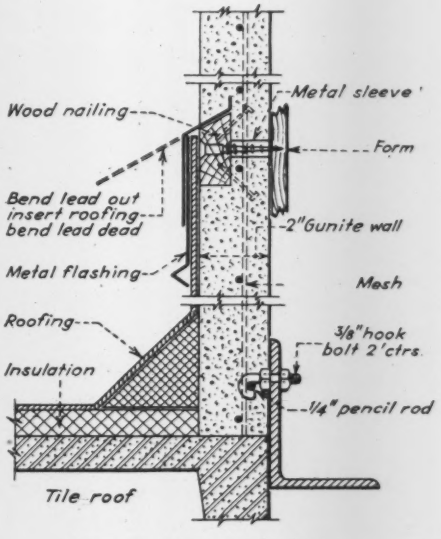
The wall design may vary because of operations carried on within the structure but a common design includes a horizontal band of shotcrete extending from footing level to the bottom of the windows, followed by a horizontal band of window sash of variable height, with the upper section of the wall consisting of another horizontal band of shotcrete extending to the roof line. Details to be observed in the design of this type of wall include: (1) steel members at both lintel and window-sill openings designed to allow sash to be bolted or welded into place and not embedded in the wall material, and (2) steel should be designed so that the shotcrete wall will set out far enough for clearance for wood forms between finished wall and edges of truss laterals or wind-bracing members.

Forms used for shotcrete walls may be considerably lighter than is usually specified because the material, when applied against a form, is placed in a relatively light coat over a considerable area of the form, which tends to stiffen the form materially before the balance of the moortar is shot into place. The forms, which are placed between the structural supporting members, may be reused as many as ten times and when built out of plywood, leave a very satisfactory surface on the exposed interior wall.

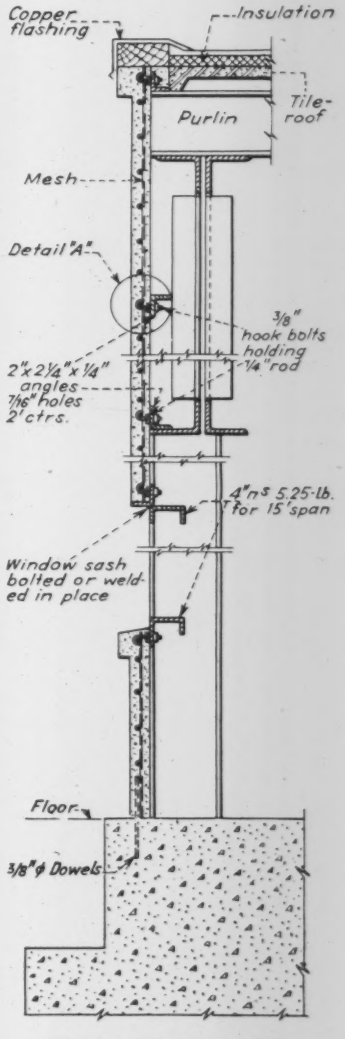
The drawings indicate a method of attaching the reinforcing steel, including the $\frac{1}{4}$-in. pencil rods, and the mesh that is tied to these rods. For this type of construction the anchors are usually $\frac{3}{8}$-in. hooked bolts set at



Detail A

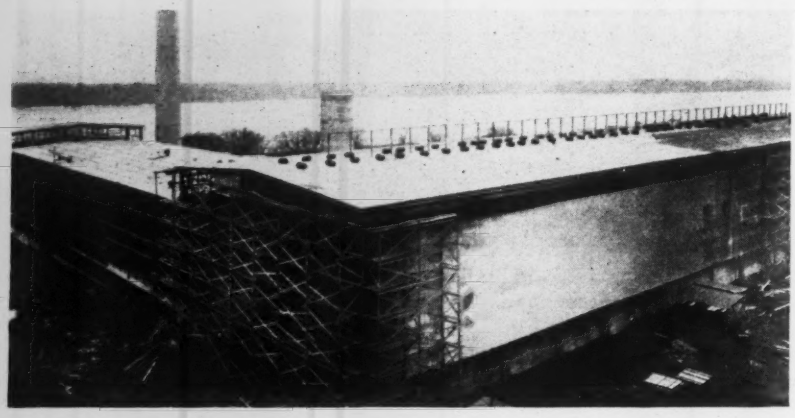


Detail at Monitor Ends



Single Exterior Wall

Design details for a wall of pneumatically placed concrete.



Walls for an industrial plant are usually 2 in. thick and are applied at a rate of about 1,000 sq. ft. per 8-hr. day per unit.

2-ft. intervals, attached to the angle supports. Customary reinforcing is usually 4-in. x 4-in. mesh of No. 8 gage or 3-in. x 3-in. mesh of No. 10 gage galvanized. The details of the angles used for horizontal stiffening of the shotcrete and the connection at the ends of monitors are indicated in the drawing. The connection illustrated for the monitor is also of use back of firewalls and where the wall comes in contact with the roof, where the connection is important and must be correctly handled to secure satisfactory results.

The mix of the shotcrete is usually 1 part cement to 4 parts of sand, and the method of mixing and placing follows well recognized practice. It is assumed that the preparation and placing of this type of material is understood by the reader.

Placing procedure

A skilled nozzle man—skilled operators are essential for wall construction—is able to bring the surface of the shotcrete to within $\frac{1}{4}$-in. of the final desired thickness and this surface may then be scraped or screeded to remove the few high places. After this adjustment has been made, the screeded surface is given a flat finish coat by flashing with the nozzle, using the same materials and the same mix, leaving the entire surface with a uniform finish.

The mesh should have a sectional area of from 0.2 percent to 0.3 percent in each direction, based on a single layer of electric-welded fabric for a 2-in. wall. This fabric should be doubled at all corners.

The foregoing information on exterior walls may be considered typical and well suited for conditions in the Midwest to the northern limits of the United States. In the extreme south states the wall section could be reduced and a lighter mesh used.

On buildings where the exterior walls are of shotcrete it is quite feasible to use this material and process from placing double partition walls on each side of a truss. These partitions are of the fire-wall type, and protect the structural steel forming any intermediate wall or any dividing truss. For such construction, ribbed paper-backed mesh may be used for forms by interposing some $\frac{3}{8}$-in. rods between the $\frac{1}{4}$-in. rods on the face of the structural steel. These rods can be tied to the quarter-inch rods and spaced so as to prevent the paper-back mesh from sagging. Incidentally the mesh on the paper is not included in determining the reinforcing value of the mesh used. Paper is left in place between the walls.

Operation Costs for Automotive Waterworks Equipment

To Receive the advice and definite data on control of automotive equipment every waterworks organization in the United States operating in cities of 100,000 to 200,000 population and all waterworks utilities in Canada were asked by Louis A. Geupel, superintendent of the Evansville, Ind., waterworks department, to submit data on cost of operation and maintenance of their automotive equipment. In the United States from 44 questionnaires, 33 replies were received with 25 including data, according to Mr. Geupel in a report at the recent annual meeting of the American Water Works Association in Toronto, Ont. Details of the survey included:

The "miles per gallon" unit average of the American cities in the population range of 100,000 to 200,000 was 10.26, while the Canadian cities of varying population show an average of 9.65. Thus the two compare very favorably, considering that the 25 cities in the United States are large with ample facilities, while many of the Canadian cities are smaller.

The average "cost per mile" for the United States cities was $.02928 and for the Canadian municipalities $.0327 based on a gasoline cost of 10 cents per U. S. gallon.

Most serious recommendations from the studies include:

(1) That water utility managements and superintendents combine a convenient record of the control and maintenance of waterworks automotive equipment combining the physical items, such as gallons of gasoline, quarts of oil, etc., used, together with the accounting form so that a complete breakdown study could be made from a simple record kept.

On the same sheet the computed results for "miles per gallon," "cost per mile," etc., could be added for reasonably quick study. The cost per gallon of gasoline and the cost of lubricating oil should always be listed plainly at the bottom of every form.

(2) That every automotive equipment supervisor study his own conditions with a view to improving the expediting of trucks and economy of operation and maintenance.

Operating Cleveland's Sewage Plants

***Contents in Brief**—When the largest of three sewage treatment plants in Cleveland was placed in operation in 1938 facilities were provided for cleaning up 30 miles of lakefront. The following abstract from a recent report outlines results achieved with each of the three plants and relates experiences with equipment operation.*

THE FIRST FULL YEAR'S operation data of Cleveland's 123-mgd. Easterly activated sludge disposal plant and the remodeled 45-mgd. Imhoff tank-trickling filter Southerly plant have been released by J. W. Ellms, commissioner of sewage disposal. The report is for 1939 and covers as well the 36-mgd. Westerly Imhoff plant placed in operation in 1922. These plants were described in detail in this journal (Jan. 9, 1936, p. 53 and Aug. 18, 1938, p. 197). Activities were centered on perfecting the operation of the various treatment processes, the adjustment and maintenance of mechanical equipment.

Effect of the treatment processes at the three plants briefly is as follows: The Easterly works, to which came a daily flow of 80.6 mgd. removed 96.4 percent of the suspended solids, 93.5 percent of B.O.D., 99.3 percent of the bacteria (99.9 percent when chlorine was applied), and 84.1 percent of the organic nitrogen. Air was applied for 5 to 6 hr. in the activated sludge process at the rate of 1.16 cu. ft. per gallon of sewage.

At the Westerly plant, where 30 mgd. was handled, 40.5 percent of the suspended solids settled out in the Imhoff tanks producing 17.4 mg. of sludge. Digested sludge containing 65.6 percent of moisture was vacuum-filtered after being conditioned with lime and ferric chloride. Lime (as CaO) averaged 11.8 percent of the dry solids in the sludge and the ferric chloride requirement was 3.62 percent. Average volume of gas used per ton of sludge cake for incineration only was 769 cu. ft. For standby purposes an additional 837 cu. ft. per ton of filter cake was used.

Activities at the Southerly plant may be broadly classified in two groups: (1) processes used on the raw sewage entering the plant and passing through the Imhoff tanks, trickling filters and magnetite filters; and (2) the processing of the sludge pumped 13 miles from the Easterly plant to the Southerly plant. The Imhoff tanks removed 38 percent of the suspended solids while further treatment in the trickling and magnetite filters produced an overall reduction of 96.2 percent; B.O.D. reduction was 93.5 percent.

Sludge from the Imhoff tanks is partially dewatered on covered sand drying beds while sludge from the clarifiers at the Easterly plant is concentrated and then passes to twelve separate digestion tanks. Of the 268 million cubic feet of inflammable gas produced from the 315 mg. of sludge sent to the digesters, some 46 percent was utilized. Filtered sludge cake contained 72.9 percent moisture, and 6.1 gal. of fuel oil per ton of filter cake was used for incineration.

Among the experiences encountered in operating and maintaining equipment at the Easterly plant were the following:

Considerable development work was done to make the 54-in. comminutors more rugged and effective, said the report. New-style combs have been of some help, and it was found that tungsten carbide teeth were superior to stellite teeth. The cylinders of the comminutors show wear, principally on the bottom sections, due to gritty material that must flow through the machines. A worn cylinder does not cut the screenings efficiently and must be replaced; accordingly new cylinders are being designed to withstand this wear. The 36-in. comminutors have given good service and are much improved over the original machines removed during 1938.

The four detritors, which take all of the flow from the 54-in. comminutors, have a capacity of 46 mgd. per unit. Outside of requiring minor adjustments from time to time, the detritors have given excellent service. They are operated about 30 min. out of every 4 hours during periods of

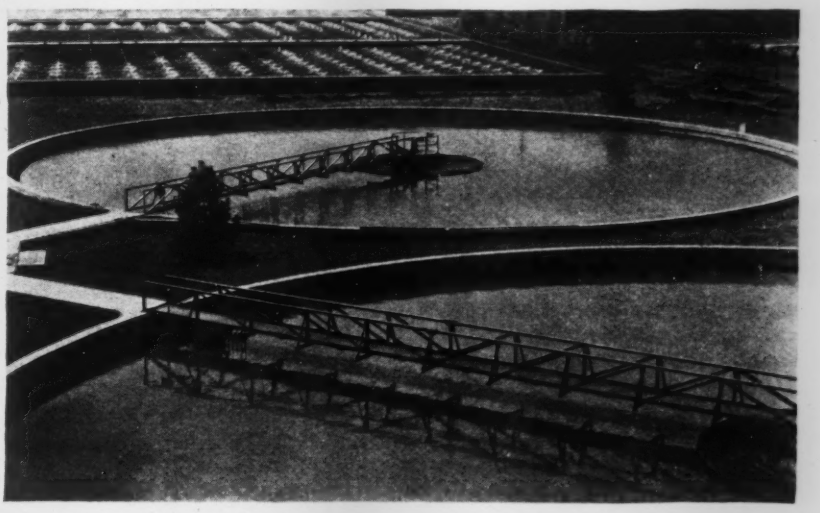


Fig. 1. Clarifiers and sprinkling filters at the Southerly treatment works.

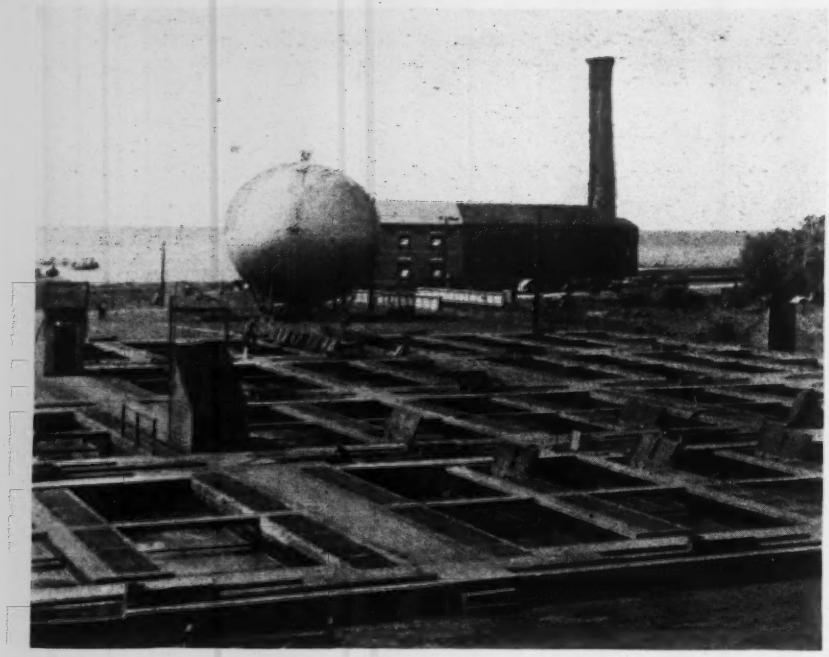


Fig. 2. At the Westerly plant, where Imhoff tanks are used for partial treatment. The gas holder and incinerator building are in the background.

dry weather flow and continuously during storm flow. The maximum quantity of grit removed in any one hour during the year per machine was 6 cu. yd.; this is about 2 cu. yd. per million gallons.

Primary tank removal has averaged 140 ppm. or 52 percent of the suspended solids found in the raw sewage during the year. These tanks have operated with a minimum of mechanical adjustment and repair, but the grease-skimming devices are in the process of being redesigned and replaced. The problem of transporting grease skimmings through a pipeline, especially in cold weather, has given considerable trouble. The accumulation of grease, shredded rags and match sticks is loosened by high-pressure water, or in severe cases, steam from the boiler plant is passed into the grease lines.

Cone valves controlling the flow of air to the aeration tanks have not functioned as anticipated in the design. During times of power failure the valves do not provide the proper protection to the diffuser plates in the aeration tanks. This problem has been under discussion since the opening of the plant in 1938, and has not been satisfactorily solved.

At the Westerly plant cotton filter cloths have been used exclusively since last February, and at the present time, are averaging 234 hr. of service. A considerable number of different kinds of filter cloths were tried during the year, with the result that the cloths now being used are quite satisfactory in operation and vastly cheaper in price that the original wool cloths used. The interior copper piping of the vacuum filters, which began failing due to corrosion by the alkaline ammoniacal filtrate, is being replaced with extra heavy black iron pipe.

Operation at Southerly works

Operation items culled from the report of the Southerly plant are as follows:

The abbreviated aeration portion of the plant is the most effective single unit in use, despite the fact that along with sewage a considerable amount of concentration tank effluent, digester effluent and vacuum filtrate was treated.

Some difficulty was experienced with clogging of the diffuser plates and swing diffuser tubes. A considerable portion of this clogging can be attributed directly to the presence of high iron wastes, which occurred periodically. The clogging effect was most apparent with the diffuser tubes, but while the plates were apparently operating as intended, investigation showed that when the tanks were partially emptied with the air on, the pressure had raised the plates sufficiently to permit escape of air around the gasket. It is intended to have the plate holders reinforced to prevent this. Both the diffuser plates and tubes were thoroughly cleaned once in muriatic acid. Raising the tubes and brushing temporarily relieved the clogging. When brushed tubes are coated with grease, the clogging seemed to be considerably delayed.

The magnetite filters were placed in operation in May, 1939. Subsequent to this date, little mechanical trouble was experienced, even during the winter months. Some sand was lost in the washing, and some sludge and sand passed through the filter bottom and accumulated in the old settling tanks which still remain. The magnetite filters were cleaned the following August, at which time the sludge was removed. Difficulties experienced in operation included the piling of sand at one end of the filters, and the formation of bare spots and bacterial growths on the bottom. Equipment that has been applied to the traveling mechanism of the filters is effectively keeping the sand at a more uniform thickness. Growths are controlled by applying chloride of lime and copper sulfate to the influent.

The sludge concentration tanks were designed to treat incoming solids having a 3 percent solids content and to concentrate this mixture to a 4 percent solids content. Past performance of the tanks indicates that the assumption in design is correct but unfortunately most of the sludge entering the tanks had a higher moisture content than anticipated. Less than 5 percent of all influent material had a solids concentration of 3 percent or more; 50 percent of the influent material had a solids concentration of less than 1½ percent. On the basis of this it appears that perhaps the further concentration of solids should be attempted before the material goes into the concentration tanks. The lack of solids concentration decreases the effective capacity of the digesters, increases the amount of supernatant to be handled, produces a thin digested sludge, causes a wastage of gas in heating the tanks and cuts down on gas production.

Probably the greatest difficulty with the vacuum filters is that of keeping clean the supporting grid screens. Various cleaning methods were devised and used but no really satisfactory method has as yet been developed. The grids were treated by using ferric

chloride alone as a conditioning agent for the sludge but the method was not very successful. Sandblasting was too abrasive on the screen-grids. The most successful method so far, is to remove the screen-grid sections and mechanically knock out the depositions with a stiff wire brush. This method is very time-consuming.

The average rate at which the incinerators were operated during the year was but 76 percent of rated capacity. The utilization rate—that is, the combination of operating time and operation rate—was only 29 percent of that theoretically available. The utilization rate is much too low and is caused, to a large degree, by maintenance difficulties.

Considerable difficulty was experienced with the burning of holes in the air bag filters on the ash line through the deposition of hot clinker material on the bags. To alleviate this difficulty an extra cooling leg was installed on the ash line, just outside of the incinerator building. But this introduced further trouble because, when the outside temperatures were sufficiently low, the air temperature in the ash line went below the dew point and caused a condensation and subsequent freezing of moisture on the bag filters, causing the entire system to be inoperative. The best solution probably would be more flexibility in the cooling legs, says the report, allowing maximum radiation losses during the hot summer months, and using only one set of cooling legs during the winter months.

There is a marked tendency for blockage of the envelope passages in the preheaters. The method used so far has been to stop the incinerator and manually clean these passages with a flat piece of metal. Warping of these envelopes also impedes proper operation.

Superintendents reporting to Mr. Ellms are as follows: for the Southerly plant, G. E. Flower; for the Easterly plant, J. J. Wirtz; and for the Westerly plant, Walter E. Gerdel.

Iron Lining Rehabilitates a Sewer

Arthur L. Boley
City Engineer, Sheboygan, Wis.

***Contents in Brief**—A box culvert storm drain was converted to sanitary sewer service by forming an invert with the aid of half-pipe sections of iron pipe. This rehabilitation cost $12 a foot, much less than would have been the expenditure for a new sewer.*

FACED WITH THE PROBLEM of separating storm and sanitary sewage in a community built on a plan of combined sewers, many troublesome questions present themselves. In this connection Sheboygan, Wis., discovered in one district that it was more economical to build new storm sewers and use an existing trunk-line as a sanitary sewer, than to adopt the more obvious method of using the box sewer as a storm conduit and build a new sanitary sewer. One of the most interesting aspects of this changeover involved the installation of an iron-lined invert.

The original installation was a 4 x 5-ft. box sewer, built in 1910. Bad groundwater conditions and inadequate pumping facilities at that time necessitated construction of the sewer for a considerable length at an elevation above the designated grade by a varying amount with a maximum deviation of about one foot, the upper 600 ft. being laid approximately level. About 2,000 ft. from the outlet, this main trunk line is formed by the junction of two sewers, one of which has a low velocity flow coming from the west, and the other has a relatively high velocity flow coming from the north. While the junction point was carefully designed and properly built, stranding was inevitable and the odors from putrefying solids were very annoying to the people in the vicinity. It was necessary to flush this section at frequent intervals in order to prevent this condition from assuming nuisance proportions.

In the fall of 1939, the writer was

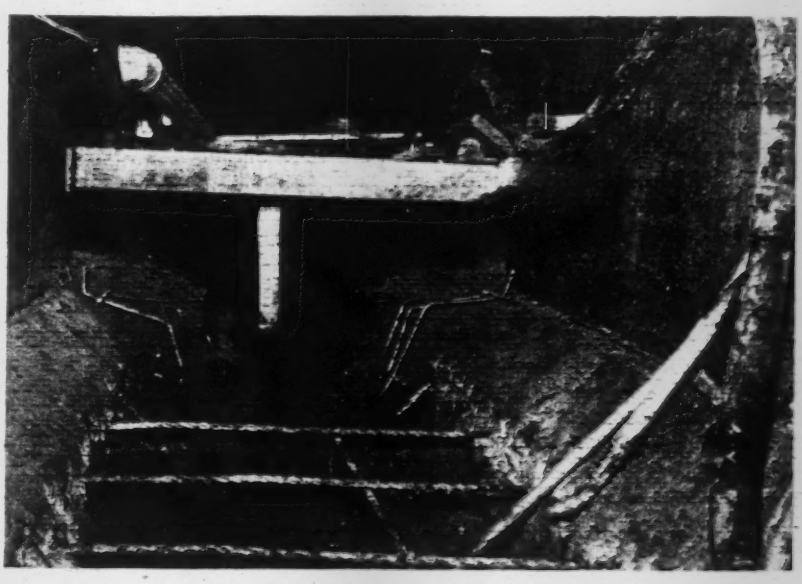


Fig. 1. Reconstruction details showing the method of forming the invert section and the replacement of reinforcing steel.

ordered by the Common Council to investigate the condition and propose a remedy. The recommendations were to use the old sewer as a separate sanitary conduit and to form and reline the bottom as shown in the accompanying drawings and picture. Permission was received from the State Board of Health to bypass a considerable portion of the raw sewage directly into Lake Michigan, provided that such diversion was discontinued before April 1, 1941. As it would have been impossible to complete the entire job within the time specified, it was decided to complete only that portion of the work where it was necessary to lower the invert.

Construction methods

Between Feb. 4, when sewage was first bypassed, and April 8, when the diversion was discontinued, about 960 ft. of sewer was reconditioned. For the greater part of the time a double crew was used, with the working day from 6 A.M. to 8 P.M. A working crew of seven men was used with two men above ground to mix concrete and handle equipment and the balance engaged in the sewer below.

A section of concrete from the bottom was first removed, the old reinforcing cut out, and the necessary excavation for the invert section made. The old reinforcing steel was spliced and the new steel was installed. Concrete was placed to a point slightly above the line of the new bottom, and half-sections of asbestos-bonded, fully-coated, paved invert iron pipe was firmly imbedded in the concrete and rigidly held to the proper grade. The latter was accomplished by using 2 x 4-in. spreaders spiked to 6 x 6-in. braces, which were wedged in place to support the side walls. The balance of the concrete then was placed. Half-section pipes were fabricated in 4-ft. lengths and the overlapping reinforcing angles of adjoining sections were bolted together.

A word of explanation about the use of the relatively expensive material for the invert lining is in order. From borings taken before the work was started, it was learned that precautions would be needed to contend with groundwater against a static head of slightly over one foot. While the dewatering problem was not considered troublesome, it was felt that serious troubles could develop from groundwater infiltration if cracks developed in the bottom of the invert. By using short sections of half-pipe, the amount of concrete and other material to be removed was materially reduced. And because the invert was removed in short sections while the sides were well braced, no cracks developed in the concrete. The butt joints between the short half-pipe sections were filled with hot-poured asphalt, thus making a watertight joint in the bottom.

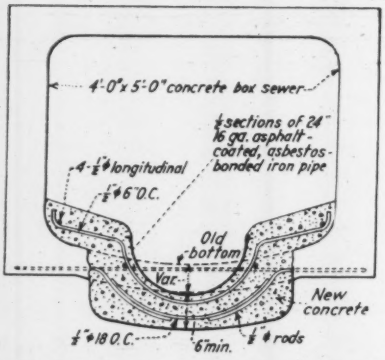


Fig. 2. Conversion of a box culvert to sanitary sewer service with the aid of half sections of iron pipe.

Most of the details of construction are shown in Fig. 1. The hose on the right is the discharge from an air-driven pump and the down[illegible]ut on the left is a temporary conn[illegible]on to a house lateral. Design deta[illegible]are shown in Fig. 2.

The work was designed by the writer and the installation was [illegible]ade under the direction of Fred W[illegible]de-meyer, superintendent of cons[illegible]uc-tion, who used the city sewer main-tenance crew supplemented by a few other employees. The total cost was $11,665 (slightly over $12 per foot), distributed as follows: labor and insurance, $5,509; material, $4,235; equipment rental (city-owned), $1,921.

As a result of the reconstruction the normal velocity of this sewer has been greatly increased. While the cross-section of the sewer has been slightly decreased, with a consequent lowering of the total possible flow, the normal carrying capacity has been greatly increased, and stranding of solids is negligible. It is our intention to replace the bottom in the remainder of the sewer next winter and we will then have a useful sanitary sewer at a sum far below the cost of a new sewer. It is with the thought that there may be other communities where similar rehabilitation work can be accomplished that we submit the record of our experience.

Copper Determinations in Water and Sewage

Interest in the effect of copper in water supplies and in sewage, due, in part, to increasing use of copper in pipes, possible changes in federal standards for drinking water, and the large volume of copper-containing metallurgical wastes being discharged to streams, has increased the importance of the determination of small amounts of this element.

Several suggested methods for determining copper were studied by C. R. Hoover, J. W. Masselli, and R. H. Coe, Hall Laboratory of Chemistry, Wesleyan University, who reported their findings before a meeting of the American Chemical Society. In general greater difficulties with sewages and sludges are experienced in preparing the sample than in the actual quantitative estimation. Comparisons of methods of preparing the sample, such as separation of copper by precipitation or extraction, digestion of the Kjeldahl method, and the conventional ashing and nitric acid extraction, have been made. The precipitation method apparently gives the most accurate results, but ashing and solution in nitric acid under certain careful control conditions may be made to give good results for routine work.

Quantitative determination by the standard carbonate method has been compared with other colorimetric methods, both visually and photoelectrically. Visual sensitivity appears to be greater unless deep layers of solution are used. The stability of unknown and standard solutions to light is apparently important.

Garbage Grinding at Goshen

Henry W. Taylor
Consulting Engineer, New York City

***Contents in Brief**—This is an interim report on operating experiences at a dual disposal plant serving a village of 3,000. Some of the matters discussed are the size of grinder screens, sludge tank design, moisture in gas, flotation of ground garbage and gas production.*

DUE TO its comparatively small size the garbage grinding-sewage disposal plant at Goshen, N. Y., provides an installation of experimental proportions, and these notes on operating experiences are offered with the hope that they will contribute to present knowledge of dual disposal.

The Goshen plant, which opened in August, 1939, was operated for about a year without the addition of ground garbage in order to establish sewage sludge digestion and to determine the effects of cheese whey discharged into the sewers by a dairy. Further delay was caused by a reluctance on the part of the village officials to discontinue delivery of garbage to a hog farm until the owner could dispose of the hogs. About one-half of the garbage was diverted to the sewage works in December, 1940, and delivery of all garbage to the plant was initiated in May, 1941.

The Goshen dual disposal plant, described in *Engineering News-Record*, Aug. 31, 1939, p. 296, includes a preliminary settling tank, two heated sludge digestion tanks, a dosing tank and sand filters, together with a garbage grinding house and equipment. The grinder is a Jeffrey hammermill-type, with a rated capacity of 6 tons per hour, the discharge from which passes downward directly to a 7 x 7-ft. cylindrical ejector tank. The ejector delivers ground garbage to a manhole on top of the sludge digestion tanks.

Sludge digestion facilities

Two heated sludge digestion tanks are provided, each having a capacity of 2 cu. ft. per capita; thus the design provides for a total of 4 cu. ft. per capita for 3,000 people. Both of the tanks have fixed concrete covers, and the overflow elevations are such as to submerge floating sludge beneath the covers. Ordinarily, sewage sludge and ground garbage are ejected to the primary tank. The primary tank overflows through liquor outlets to the secondary tank, while the secondary tank overflows to a liquor line leading to the influent manhole of the sewage settling tank. Fresh sludge or freshly ground garbage can be delivered to either of the two tanks. Primary sludge is transferred from the primary to the secondary tanks by means of the ejector. Digested sludge withdrawal takes place by gravity from the secondary tank to the sand drying beds, while a make-up pump automatically maintains water levels in both tanks.

Principal operating problems

The writer's experience indicates that there are two main factors of importance in the process of disposal of ground garbage with sewage sludge. The first factor involves mechanical and hydraulic elements, and the second involves biological action. Mechanical and hydraulic problems include the grinding and handling of sludge and ground garbage. The biological problems include such factors as the percentages of sewage sludge and ground garbage, methods of plant operation, effect of resultant sludge liquors on subsequent treatment processes, amount of gas increase due to the addition of volatile matter in the ground garbage and sludge tank design.

Considering first the mechanical and handling problems, it should be noted that the hammermill grinder involves four major parts—the revolving hammers, the crusher plate, the screen, and the rejection chamber. Design of hammers to suit any particular type of material is a matter of considerable importance and this construction will vary all the way from the use of thin knives to the employment of thick, heavy hammers. The hammers used at Goshen are about $1\frac{1}{2}$ in. thick and about $2\frac{1}{2}$ in. wide. The crusher plate, against which the hammers first throw the material to be ground, and the adjustment of this plate, are of primary importance. If the crusher plate is set too close to the hammers they will be forced back, and if the clearance between the plate and the hammers is too great, the material will not be sufficiently crushed to pass through the screen quickly. The initial setting of the crusher plate needs to be checked for a particular type of material, and it was found at Goshen that it was advantageous to increase the crusher plate clearance by a fraction of an inch.

Importance of screens

The screen of a grinder limits the size of the grinding, the larger-sized material being rejected and carried around again against the crusher plate for size reduction. The screen bars also probably accomplish a limited amount of cutting of the material, thus supplementing the work of the crusher plate. A $\frac{1}{4}$-in. screen was first installed but experience proved that this was too fine, required an unnecessary amount of power, and unduly reduced the capacity of the grinder. It was decided to install a $\frac{1}{2}$-in. screen that spread to $\frac{3}{4}$ in. at the end of the screen. Finally, however, a $\frac{3}{4}$-in. spacing was adopted and a noticeable improvement in operation was experienced. It appears that screen sizes below 1 or $1\frac{1}{4}$ in. make only a slight difference in the physical characteristics of the ground material, but above this size the characteristics of the ground material change radically. However, power re-

quirements and capacity were affected considerably by increasing the screen openings from $\frac{1}{2}$-in. to $\frac{3}{4}$-in. spacing. There is at present no reason to believe that the $\frac{3}{4}$-in. screen interferes with the success of the digestion process.

Operating experience has indicated that the gate that shuts off the ejection chamber must be nicely fitted to the frame of the shredder. Otherwise, partially ground material will be forced through the joints between the gate and the frame, and this will fill the rejection chamber until it becomes packed full. At Goshen, it was necessary to add strap iron bands to each side of the rejection gate so as to prevent leakage of partially ground garbage to this chamber and additional weights were added to keep the gate closed for anything other than extremely heavy material. The size of the screen will materially affect the quantity that unavoidably reaches the rejection chamber since, with a fine screen, much of the material is probably ground several times and repeatedly passes the rejection chamber for subsequent grinding. The $\frac{3}{4}$-in. screen thus far has proved satisfactory and in most cases immediate crushing and grinding takes places without waiting for the grinder to clear itself.

Ground garbage floats

It has been found that ground garbage in the ejector tank rapidly yields to flotation. If the material in the tank is not promptly ejected to the sludge tank the first discharge of ground garbage, coming from the bottom of the tank, is fairly thin, while the last discharge, representing the material originally at the top of the tank, is so thick as to require additional air pressure and involve a very considerable frictional resistance. The practice at Goshen is to empty the tank immediately after the grinding operation has been completed.

Bulkiness of ground garbage is a factor dependent upon the amount of water used during the grinding process. With a relatively small amount of water 4.35 cu. yd. of garbage measured in the garbage truck has been reduced to 3.55 cu. yd. in tank displacement after grinding. However, if a suitable quantity of water is used, 3.8 cu.yd. of garbage measured in the garbage truck will displace about 5.7 cu. yd. in the ejector tank. Present practice dictates the use of about 600 gal. of water per ton of garbage.

GAS PRODUCTION WITH AND WITHOUT GARBAGE ADDITIONS

Period	Operating Condition	Cu.Ft. Gas Per Day	Cu.Ft. Gas Per Day Per Capita
10 months	Sewage only	3,240	1..
5 months	Sewage plus part garbage	4,230	1.5
3 months	Sewage plus total garbage	7,500	2.7

The total power used at the sewage works, including the grinder, has averaged only 600 kwh. per month since all the garbage has been ground, and the total cost of this power including the demand charge has averaged only $40 per month.

Garbage is sorted

Garbage at Goshen contains an unusual amount of wet paper. This material has about the same resistance to the grinding process as corn husks, which are notorious for power demand. Due to the relatively small amount of material handled at this small plant a careful sorting of the material is carried out prior to delivery to the grinder, and this sorting eliminates large bones, cans, metals, etc. The cans in the garbage are relatively small in amount per ton, as past practice in the village has demanded that these cans be omitted from the garbage. Some metal bottle tops will elude the screen of the grinder, and some evidence of ashes and coal are found in the digested sludge. None of this foreign matter, however, has involved any handling difficulties in either tank, with one or two exceptions when a few minutes of jetting through pressure jets was required to relieve a momentary congestion.

It appears that gas emanating from the combined digestion of sewage sludge and garbage contains more moisture than normal sludge gas. Some trouble has been experienced with the gas meters in that the bellows of the meter became partially filled with moisture and the meters must be removed for drainage of the case and bellows. In order to overcome this characteristic of the sewage-garbage-sludge gas, additional drips have been installed at critical points.

Jets submerge sludge

As previously noted, fresh ground garbage has a tendency toward rapid flotation. This same characteristic influences the behavior of the digestion tanks, and unless care is taken in the operation of the primary digestion tank, a considerable blanket of floating sludge will soon accumu-

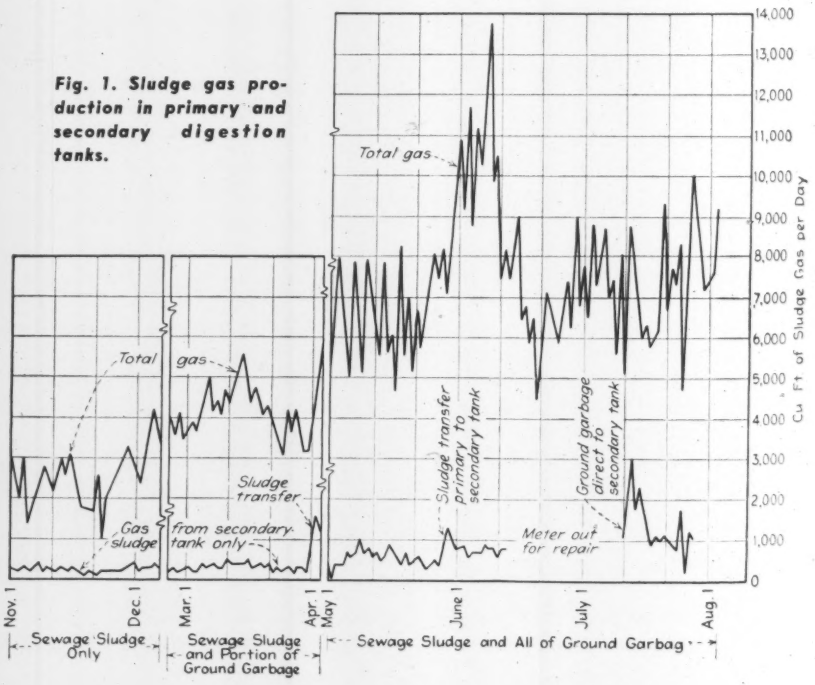


Fig. 1. Sludge gas production in primary and secondary digestion tanks.

late. This action is corrected and prevented by jetting the floating sludge with hot supernatant liquor through a jetting pipe which extends through the cover of the gas dome and is equipped with a nozzle in a horizontal position. The height of this nozzle can be adjusted so that it will be from 6 in. to 2.5 ft. below the concrete cover and, in addition, the nozzle can be rotated to discharge along all radii of the tank.

Gas production

Gas production is materially increased by the addition of the ground garbage to the sludge digestion tanks. Variations in gas production under three conditions of operation are shown in the accompanying table at the top of preceding page.

Comparing the last and the first average figures in the last column of the table the ratio is 230 percent. However, it is thought that the average gas production will continue to increase during the next few months of operation.

Peak gas production for any day has been over 13,000 cu.ft. whereas 9,000 cu.ft. is frequently recorded, with intermittent lulls in the rate of production. Digestion of the total garbage has not extended over a sufficient period to produce an established gas curve. In Fig. 1 is shown typical sections of the gas curve under different operating conditions and this is indicative of the effect of ground garbage introduction in varying amounts as well as the effect on the secondary tank when ground garbage is delivered to it directly.

The secondary sludge digestion tank has produced an average of about 300 cu. ft. of gas per day when operating purely as a storage and decanting tank. When primary sludge is transferred to the secondary tank gas production naturally increases. Several charges of ground garbage have been delivered direct to the secondary tank, as a result of which gas production reached 3,000 cu. ft. per day.

In connection with the gas curve, it must be noted that for collection purposes, the village is divided into two sections, and garbage is collected from each of these sections twice weekly. Ground garbage is delivered to the primary digestion tank on Tuesday, Wednesday, Friday and Saturday mornings. The actual collection of garbage takes place in the late evening, and the material is dumped on the grinding house floor and the grinding takes place early the next morning.

Supernatant liquor

A major fear in the minds of many as to the effect of introducing ground garbage into a sewage sludge digestion tank is that the resulting sludge liquor returned for treatment will show a high biochemical oxygen demand, a high solids content, and considerable organic matter in solution. When the Goshen plant was operated for sewage treatment alone, the required 2 cu.ft. per capita storage for sludge digestion was available in the primary tank. The secondary tank, containing another 2 cu. ft. per day

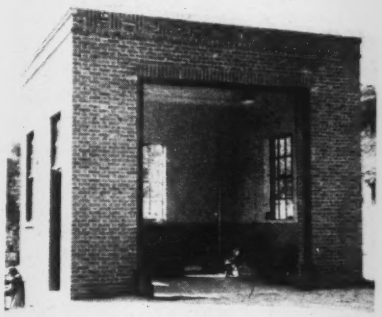


Fig. 2. Garbage grinder house at the Goshen sewage treatment works.

per capita capacity, acted solely as a storage and decanting tank wherein the settleable solids in the primary liquor were given an opportunity to drop down and the sludge could slowly de-water itself to a low moisture content of about 83 percent.

Under these conditions the normal overflowing sludge liquor from the secondary tank was found to have a 5-day B.O.D. of about 150 ppm. Since the introduction of ground garbage B.O.D. determinations have been made to indicate the relation between the primary and secondary liquors. Samples of both liquors, 30 hours after ground garbage had been discharged directly into the secondary tank, gave the following results in a 5-day B.O.D. test:

Primary tank liquor	1,600 ppm.
Secondary tank liquor	570 ppm.

Direct application of ground garbage to the secondary tank, however, produced a gas activity that interfered with settlement, roiled the liquor and raised the B.O.D. and the total solids content. An average B.O.D. for the secondary liquor has not as yet been established, but it is estimated that it should not exceed 300 ppm. with proper operation. In order to protect the sewage treatment process amply, overflowing sludge liquor must be given an opportunity to settle thoroughly before it is returned for treatment. However, the period required for adequate settlement of the primary sludge liquor is comparatively short when this settlement takes place in a quiescent state.

There is also the probability that further operation will show the inadvisability of pro-rating 50 percent of sludge digestion to the primary tank and 50 percent to the secondary tank. It may be that a larger proportion should be allotted to the primary digestion or that possibly a third tank of relatively small proportions should be used solely as a decanting tank for both sludge liquor and digested sludge.

Gas utilization

For small communities deriving about 1 cu. ft. per capita per day of gas from sewage sludge digestion alone, there are few practical uses for the gas. When gas output is increased 230 percent, however, the possibilities for utilization are evident. In the case of Goshen, for instance, the gas produced by the sewage-garbage-sludge digestion is more than sufficient to provide all of the electric service required by the village except that for street lighting. The available gas could be used for production of power needed for the water pumping station, at the water filtration plant and at the sewage works. With a diesel auxiliary supplementing the gas now available, it would be possible to take over all electric service for the municipality, the present cost of which totals about $13,000.

In these notes it has been the writer's intention to indicate the trend of results being obtained at the Goshen plant, and the various ramifications into which the garbage grinding process leads. Continued observation at the plant will provide a more complete picture of the process and indicate more fully its limitations and its assets.

Sewage Engineers Unravel Legal Snarl

Arthur Wardel Consoer
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***Contents in Brief**—Strangled by court orders, the village of Barrington, Ill., found itself in a bad situation in regard to its sewage disposal. This article is a case history of engineering service that freed the harassed village from legal restrictions which had tied up its sewerage system. It also depicts a clever blending of old and new facilities for sewage disposal.*

AFTER FOUR YEARS of expensive litigation between the village of Barrington, Ill., and certain estate owners west of the village, the Circuit Court of Lake County, Ill., handed down a decree on May 18, 1931, which perpetually enjoined and restrained the village from emptying or draining, or permitting to be emptied or drained, directly or indirectly, into Flynn Creek at any point above the lands of the complainants any sewage or the effluent of any sewage treatment plant, or *of any water mingled with sewage*. The village was allowed one year from the date of the decree to do the necessary construction work. At that time the village was maintaining a combined sewer system and a sewage treatment plant consisting of overloaded Imhoff tanks and sprinkling filters. It was obvious that a modern sewage treatment plant must be built, including a long outfall sewer to conduct the effluent from that new plant to a point downstream from the property of the complaining owners, and that it would be necessary for the village to build such separation sewers as would insure the operation of a truly dual sewer system, consisting of separate sanitary and storm sewers. No sanitary sewage must enter the storm sewer system and no bypass or overflow arrangement at the new plant would be feasible under the decree of the Circuit Court.

Engineering history

Ever since 1924 the village had been trying to solve its sewerage problems, when a combined sewer system with treatment plant consisting of Imhoff tank and sprinkling filters was built by special assessments. This work was completed early in 1927 in the face of legal protests from downstream property owners. Litigation concerning the sewer system continued and several different unsuccessful efforts were made to solve the problem by engaging various engineers to prepare reports and plans. Toward the end of 1933, with a PWA grant possible, a definite start was made on a final solution.

Obtaining funds for construction of new sewers and a new sewage treatment plant depended not only upon the settlement of certain old claims regarding sewer engineering and construction, but also on the obtaining of flowage rights for an outfall sewer from the village limits along the Chicago & Northwestern R. R. and along the Northwest Highway to Flynn Creek, a distance of 12,400 ft., and for the use of Flynn Creek as an outfall stream for more than 3 miles to the Fox River. This affected 18 tracts of land. In view of the advantage previously gained against the village by the property owners along Flynn Creek between the village limits and the Northwest Highway, it was necessary to work diligently in order to obtain the needed flowage rights, and to obtain them reasonably. A map was prepared of the entire area, and samples of stream water were taken at 14 strategic points and analyzed, to be used in litigation for flowage rights. Negotiations were started with the owners of the 18 tracts of land, and when they demanded $120,000 for the flowage rights sought, condemnation proceedings were started. After trial had continued for three days and witnesses heard, all easements for flowage of sewage plant effluent were obtained for about $4,500.

The village authorities then secured state legislation to enable construction of a sewer system on a service charge repayment basis. The village obtained a PWA grant of around $130,000 in 1934, or about 30 percent of the cost of the proposed project; and the loan required was obtained by selling sewer revenue bonds to private parties.

Building the system

In designing the dual systems of sewers, use was made of all existing parts of combined sewers: the larger combined sewer trunk lines were adapted for storm sewers and new trunk lines were built for sanitary sewers. Many of the abandoned tile lines were also put back in service as storm sewers. Some of these tile lines had been forgotten and were "discovered" by the field engineers. The "separation" sewers were constructed under two separate contracts, one effective in 1936 and one in 1937. An efficient and extensive inspection service maintained during the construction period insured a separation of the combined sewer connections so that sanitary wastes could not mingle with stormwater and contaminate the outfall stream.

To insure a most effective treatment of raw sewage, a complete new sewage treatment plant was constructed of the activated-sludge type with comminutor screens, straight-line sludge collectors for primary settling tanks, air-diffusion aeration tanks, circular sludge collector mechanisms in the final settling tanks, and separate sludge digestion tanks.

Standards of design were:

Removal of suspended solids	95 percent
B.O.D. removal	95 percent
Aeration period	6 hr.
Primary sedimentation	1½ hr.
Sewage flow	750,000 gpd.
Air volume	1 cu.ft. per gal. of sewage
Final sedimentation tanks: Overflow rate	1,400 gal. mixed liquor per sq.ft. daily.

During the early operation of this plant the design capacity was frequently exceeded by the incoming flows and it was often necessary to bypass part of the flow to the outfall sewer and occasionally directly to Flynn Creek adjacent to the plant. Thereupon there was undertaken in 1937 and 1938 the straightening and deepening of Flynn Creek through the village to lower the water table where infiltration of groundwater into sanitary sewers was excessive. Likewise, during 1938 and 1939, an intensive campaign was carried on to eliminate all roof water connections from sanitary sewers. In one large subdivision, where infiltration was found to be excessive, the terminals of house connection stubs were all uncovered by hand excavation. It was found that many of these sewer ends had been crudely sealed with plain wooden discs or two loose bricks. In all such cases the terminals were sealed with a vitrified tile disc firmly cemented in place.

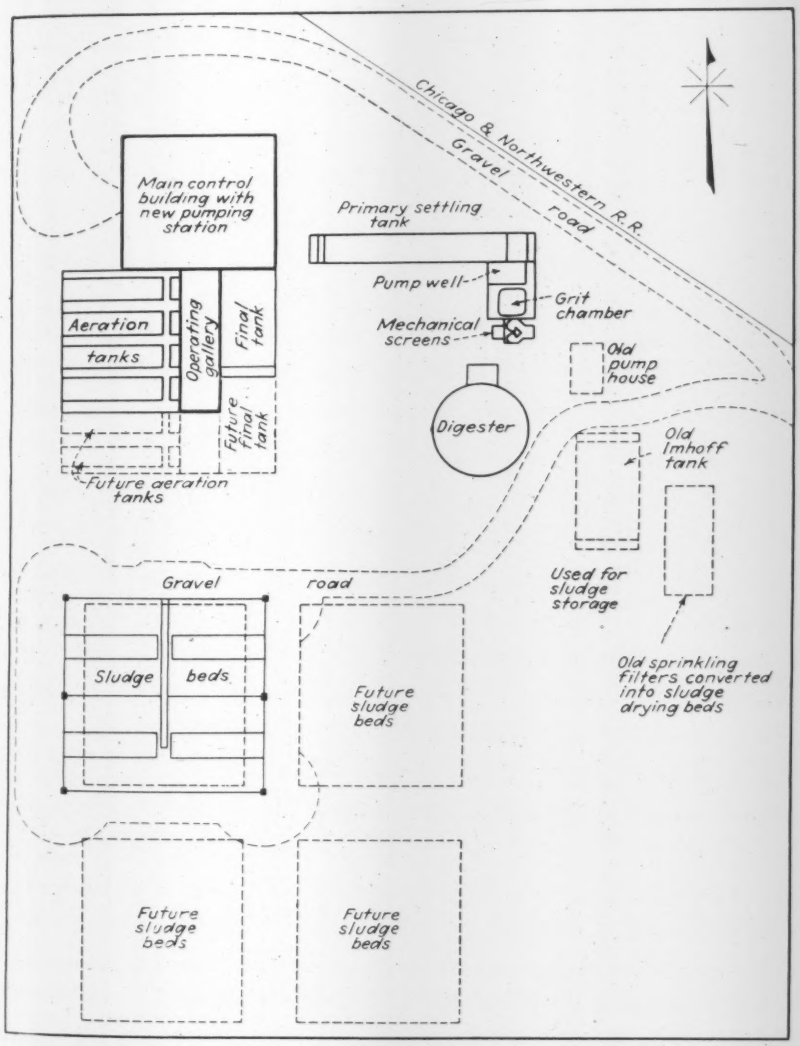
As a result of all these corrective measures, it was found during 1940 that the maximum daily flow had been reduced from 2.8 mgd. to 0.5 mgd. The project was then considered complete and operating in strict compliance with all court decrees.

Operation of this plant to date indicates that a 96 to 98 percent elimination of suspended solids and biochemical oxygen demand can be maintained easily. Neighborly relations are again effective with the property owners downstream; and the members of the village board of trustees can rest their heads on their pillows peacefully through the night so far as sewer problems are concerned.

The village authorities now point with pride to the fact that in the construction of the sewage treatment plant, use has been made of nearly all existing structures of the old Imhoff plant. The old pumping station is being retained for standby service to the sewage pumps in the new pumping station; the old Imhoff tank is used to store digested sludge during the winter months; the dosing chamber is used in part for storage space; and the old rock filter bed has been converted to a sludge drying bed by removing the lateral pipes, removing 2 ft. of rock, applying 4 in. of pea gravel, 8 in. of filter sand, and using the 12-in. header pipe for sludge distribution. The old sludge drying beds are used also, and with the new drying beds the village has sludge drying facilities totaling 4 sq. ft. per capita. The use of the old Imhoff plant in this manner has created much good will among the taxpayers who paid for the old plant by special assessment.

An outstanding feature of the new sewage treatment plant is the landscaping, and the way the operators of the plant are maintaining it. Around the sewage treatment plant the village has its finest park spot.

The new plant was designed and built under the supervision of Consoer, Townsend and Quinlan, consulting engineers, Chicago.



Old features of the sewage plant were worked in with new units in solving sewerage problems complicated by legal difficulties.

Recovery of Chemicals From Pickling Liquor

Two processes for the recovery of useful products from waste consisting of iron sulphate in solution have been developed in the laboratory of the New Jersey State Experiment Station, according to Harry W. Gehn, who described the methods at a recent meeting of the American Chemical Society. One process involves the production of sodium sulphate of very high purity and a sludge free of sulphur, which can be returned to the blast furnace where the iron is recovered. The other process consists of converting the free acid in the liquor to ferrous sulphate by contact with iron scrap. The sulphate is converted to ferrous chloride by treatment with calcium chloride. The precipitated gypsum is filtered out and the liquor chlorinated to form ferric chloride.

Notes on Sewage Disposal

A monthly summary of current developments conducted by Willem Rudolfs

ATTRACTS VISITORS—Many cities have taken steps to make more attractive the surroundings of waterworks and sewage treatment plants, but Hickory, N. C., population 7,363, has made the beautification a cooperative project of city and citizens, the American Municipal Association reports.

In six months, the North Carolina city's sewage plant grounds have been turned into a rose garden, which 2,000 visitors from 11 states visited on a single Sunday in July. Public contributions of cash, plants and materials installed the garden, which is maintained by employees of the disposal plant. Fertilizer for the bushes is obtained from sludge. The garden now has more than 4,000 plantings and is expected to include 10,000. During the blooming season roses are cut once a week to provide bouquets for all patients in the city's hospitals.

COPPER WASTE—Waste from copper plating may seriously affect fish life, disturb sludge digestion and gas formation, affect bacteriophage activities in streams and may be detrimental when the stream receiving the waste is used for potable purposes. Sierp (*Vom Wasser*, Vol. 14, p. 230, 1940) describes several methods of treatment, two of which appear to be fairly effective. Continuous treatment of wastes containing from 200 to 2,000 ppm. copper was given in a small tank filled with fine iron shavings; after rapid mixing the copper was precipitated on the surface of the iron. Within one minute about 95 percent of the copper is removed. To remove the last traces the treatment is continued for ten minutes, the sludge is settled and the liquor treated in a bed of coarse iron shavings followed by fine shavings.

On account of the difference in specific gravity of the iron filings and precipitated copper, separation can be accomplished by modifying the revolution of the mixing paddles. The light copper particles are carried over and settled separately. During treatment the iron shavings become smaller and lighter, causing the removal of fine iron particles with the copper, so that a second mixing and settling device is necessary. The method may be considered as a floating filtering device. During treatment hydrogen gas is evolved, which must be removed by suction to prevent interference with settling. The floating filter removes the last traces of copper, without formation of copper sulphate through possible re-oxidation with the evolved hydrogen gas.

The other method is an electrolytic method developed by the Siemens-Schuckert Co. for their factories. The copper waste is treated with sulphuric acid and treated in stone batteries. For each kilogram of pure copper produced, about 1.5 kilograms of sulphuric acid is regenerated. The treated material is used again for pickling. As cathode sheet copper waste is used, a current density of 250 amperes per square meter is employed. The method is continuous and said to be economical.

TANNERY WASTES—Large quantities of finely divided material and colored matter in tannery wastes created a disposal problem because these wastes clog sewerage systems, and direct discharge into streams causes appreciable pollution and color. Spent tan liquors contain over 30,000 ppm. suspended material and over 13,000 ppm. biochemical oxygen demand, represent about half of the total tannery wastes. Riffenburg and Allison (*Industrial and Engineering Chemistry*, June, 1941) experimented with a pilot plant in which they mixed the wastes and stored them for 24 to 36 hr. The wastes then were pumped from the storage tank to mixing basins where flue gas, taken from the power plant, was blown through a spider at the bottom of the tank until the waste was nearly saturated, and the pH lowered between 6.7 and 6.4. Lime water was added until the solution was basic to phenolphthalein and then settled. After 3 hr. the supernatant liquid was drawn off and treatment repeated, settled and discharged. The sludge was dewatered. An average B.O.D. reduction from 13,400 to 3,000 ppm. was obtained by the first treatment and a further reduction to 1,140 ppm. by the second treatment with a final color reduction from 64,800 ppm. to 427 ppm. Final bleaching with chlorine was possible but very costly.

ODOR CONTROL—Causes and the prevention of objectionable odors at sewage treatment plants are the subject of an article for plant operators in the September issue of *The Clarifier*, official bulletin of the Illinois State Board of Public Health. Operators are warned not to disregard complaints, for while these odors do not cause disease they do affect digestive and other functions and thus cause bodily discomfort. Furthermore, smells and complaints are not favorable to harmonious public relations. Odors are classified in two groups: those resulting from gases formed during the passage of the sewage to and through the plant; and incidental or plant odors due to improper maintenance.

Putrefaction causes odor troubles and is due to four factors: (1) presence of organic matter, (2) action of bacteria, (3) the time that these two have been in contact, and (4) the rate at which the bacteria work. This last factor varies with temperature, fresh sewage sludge at 60 deg. F. requiring 65 days for digestion, while at 110 deg. it requires only 17 days. If the time of contact is short, or if the amount of organic matter (strength of sewage) and number of bacteria are small, decomposition will remain in the aerobic stage and little or no odor occur. If these conditions can be controlled, sewage odors may be prevented or materially reduced.

Incidental or plant odors are usually due either to careless maintenance or to defective operation of the plant. Typical causes are dirty screen chambers, sludge accumulation in settling basins and foaming in digesters.

POLLUTION of waterways because of war efforts would be a hindrance to industry, says *The Surveyor*, pointing out that many factories in England require reasonably clear river water for their functioning.

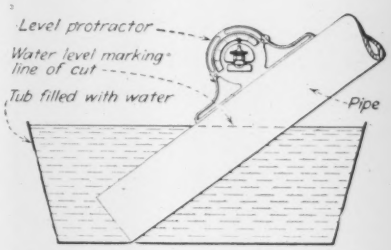
From Field and Office

Working problems and time-saving methods for engineers and contractors

Making Mitered Pipe Joints

The September, 1941, issue of *Oxy-Acetylene Tips* magazine describes an easy way for marking the correct line for cutting pipe when making mitered joints for elbows. The method, which requires only a tub of water and a level protractor, is illustrated by the accompanying sketch.

The procedure is to submerge the end of the pipe under water at one-half the desired angle of bend, which calls for the use of the protractor. Then, by marking the pipe at the water level with chalk or soapstone, the correct cutting line for that particular angle is readily indicated. If desired, a templet for duplicating the cut on other pipe of the same diameter can be made by placing a piece of heavy paper squarely about the pipe, tracing the cut, and then cutting away the scrap portion of the paper to form a permanent templet.



This illustrates simple method for marking cutting line when making pipe bends.

In the example illustrated, the pipe is inserted at an angle of 37½ deg., which will give a two-piece mitered joint of 75 deg. If a bend consisting of more than two sections is desired, the correct angle of each cut required can be determined from the following equation:

$$2\,\frac{\text{Total Angle of Bend}}{(\text{Number of Sections} - 1)} = \text{Angle of Cut}$$

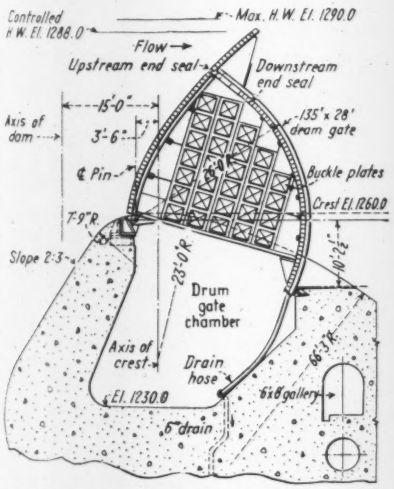
Strong-backs and Ringbolts Aid in Moving Assembled Forms

Timber forms, built to the shape of inspection galleries and other passageways through Friant Dam, are designed for a method of pickup that does not require wire rope slings to be put around the finished assembly. This is accomplished by use of a strong-back or heavy timber placed longitudinally inside the supporting frame and near the upper portion of the form. Two or more ringbolts are put through the top of the form and through the strong-back timber. Thus lifting stresses are transferred to the

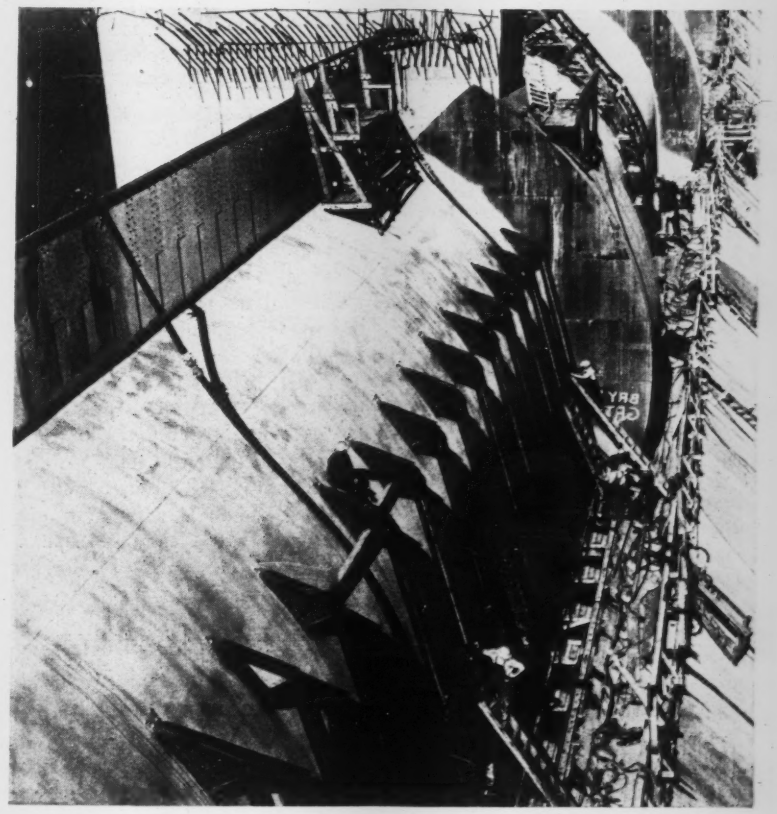
HYDRAULIC JACKS LOWER GRAND COULEE GATES INTO PLACE

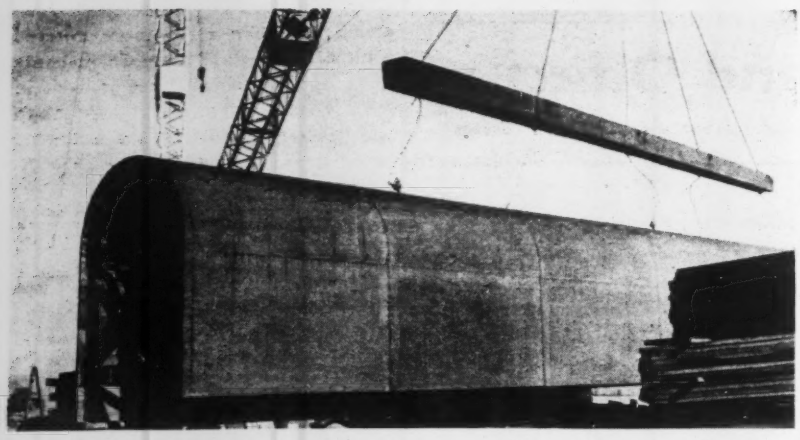
To lower each of the eleven 28x135-ft. drum gates being built to control discharge over Grand Coulee Dam on the Columbia River hydraulic jacks are used on each gate's downstream side, as illustrated by the accompanying photograph of operations at Gate No. 11. For each gate a battery of 20 jacks, operated by a master pump and capable of lifting 25 tons, are used.

After a gate has been lowered the length of the jack pistons, the jacks and jack brackets are removed and the remaining holes plugged. The gate is then floated and its position controlled by introducing water in the drum gate chamber and varying the water's height, as illustrated by the drawing at the left.



Gate section indicating size and operation.





Inspection gallery form, assembled in the carpenter shop, ready to be lifted on a flatcar by a 4-point support.

strong-back on which the skeleton frame of the assembly rests.

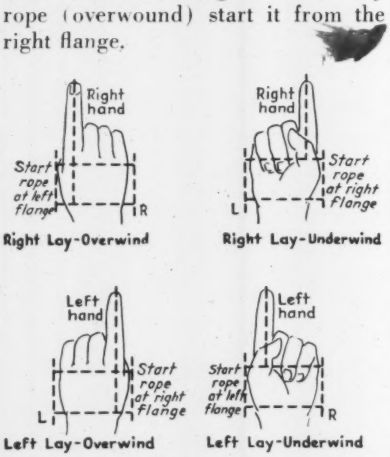
When the form is picked up by the derrick, a spacing beam is used if more than one ringbolt is to be engaged, thus causing cables and clevises for attachment to the ringbolts to be suspended vertically over each bolt. After the form has been set in place in the dam, ringbolts are removed and the holes thus left in the top of the form are covered with small pieces of tin fastened in place with tacks. On this job, such forms are always surfaced with plywood and oiled.

The frames in the forms have to be removed from the inside after the concrete has hardened, of course, and to facilitate this those nailed joints that have to be taken apart in the dismantling process are put together with doubleheaded nails, thus giving the advantage of a fimly nailed joint at the same time that the upper or second heads project for convenience in withdrawal.

Friant Dam is being built for the U. S. Bureau of Reclamation under contract held by the Griffith Co. and the Bent Co.

Handy Rule for Drum Reeving

There is a rule, a rather complicated one, that tells at which flange to start roping a smoot drum. Here's the rule: When a right-lay rope is being underwound on the drum (which is to stay, it leads from the bottom of the drum) start it from the right flange, looking at the drum from the rear; if a left-lay rope, start it from the left flange. Conversely, if a right-lay rope is being overwound (that is, it leads from the top of the drum) start it from the left flange; if a left-lap rope (overwound) start it from the right flange.



Hand signals for roping drums.

This is a complicated rule to remember, and more frequently than not quick reference to it is not available at the machine. The drawing shows a far simpler rule: Use the doubled-up fist to represent the drum, and the index finger to indicate the flange. With right-lay rope use the right fist. With left-lay rope use the left fist. For overwound rope keep the fist back up; for underwound rope, palm up. Pointed to the drum the index finger will indicate both how the rope should lead from the drum and from which flange.—RUSSELL S. WILLIAMS, *Reincke-Ellis-Younggreen & Finn, Chicago, Ill.*

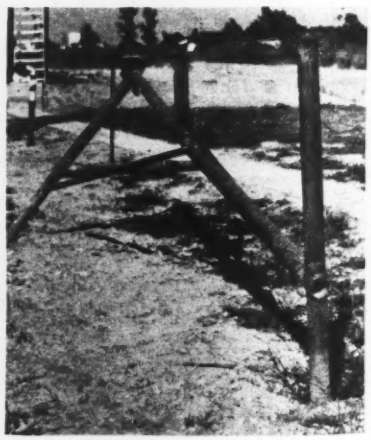
Median Strip Curb Design

California's experience with a roll curb on the median strip between opposing lines of traffic has not been satisfactory and the Division of Highways in that state has gone back to a type of curb that will give more positive separation. With the roll curb as a limit at the roadway edge, drivers were inclined to let automobiles ride over it into the median strip beyond. This tendency is stopped by a curb 6 in. high in which the face slopes back 4 in. from the vertical, a design that now has been adopted as standard for median strips in California. When protected on both sides by curbs of this type, a median strip only 6 ft. wide is believed to be effective.

Skeletonized Pipe Vise Stand

From a few feet of scrap pipe a skelton stand for a pipe vise and an outboard support for the pipe being worked on may be fabricated. The stand combines light weight with simplicity without sacrificing strength or rigidity. The front end, carrying a flat plate upon which the vise is bolted, is made A-shaped, with a tail member extending backward and downward to a footpiece. Sloping braces from the A-frame to this tailpiece stiffen the front and provide necessary resistance against overturning when threading the pipe.

To enable comparatively short lengths of pipe to be worked on, a mid-support is made of a short pipe nipple, carrying half of a large collar welded with the open surface upward, so as to center the pipe automatically. When used in soft ground, both legs of the "A" and the end of the tail-pipe are shod with flat plates large enough to insure adequate bearing.—ELTON STERRETT, *Houston, Tex.*



Scrap pipe provides sturdy, simple, light-weight stand for pipe vise.

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

Water and Sewage

SANITARY ENGINEERING—By Harry G. Payrow. 483 pp. International Textbook Co., Scranton, Pa. Price $4.

Designed as an introductory text to water supply and sewage disposal practice, this new book should appeal to operators and to others who lack special training in sanitary engineering. It is comprehensive in scope, including an outline of hydraulic fundamentals, discussions on streamflow, water consumption, and sewage flow, and concise descriptions of processes and equipment used in water and sewage treatment.

Each chapter is followed with a list of problems and references to supplementary literature on subject matter previously discussed.

Engineers and Engineering

THE ENGINEERING PROFESSION—By Theodore J. Hoover, and John C. L. Fish. 441 pp. Stanford University Press, Stanford University, Calif. and Oxford University Press, London. Price $5.

Who is an engineer, and what is engineering? How often those questions have been asked and how seldom adequately answered. Here, in an admirably well organized presentation, is an answer which should satisfy the most exacting member of the profession.

The basic purpose of this book is to provide a text for study by aspirants to any one of the many fields of engineering practice, but its character is such that any engineer will find much of value and no small amount of inspiration within its covers. For engineering students at the close of their second or the opening part of their third year, it should be prescribed reading.

Discussion of the two questions in the opening sentence of this review makes up the introductory chapters of the book. Following that is a very well handled presentation of the field and functions of engineering with separate chapters on the several major fields and their subdivisions. Having thus laid the necessary background the authors take up a broad discussion of engineering in three notable chapters entitled "The Method of Engineering," "Application of the Engineering Method," and "Uncertainties in Engineering." These three chapters are followed by chapters on vocational guidance in engineering, education of the engineer, and an inspirational closing chapter entitled "The New Call to the Engineering Profession."

The lucid summary of how engineers go about the systematic application of their knowledge, as set forth in the three central chapters of the book, should be read by young engineers with much care. It will be read by many older engineers with a certain amount of humility as they realize how often they have fallen short of the ideal of what should constitute an engineer and of how engineering should be practiced.

Safer and Faster Traffic

TRAFFIC ACCIDENTS AND CONGESTION—By Maxwell Halsey. 400 pp. John Wiley & Sons, New York; Chapman & Hall, London. Price $4.

"The engineering prohibition of accidents is the only one which will guarantee permanent results." This principle, one of some hundred odd principles discussed by the author, may be said to be the thesis of this unusual approach to accident and congestion problems. Yet this book is not an engineering text. It is written from the popular approach rather than a purely engineering approach because it is addressed to laymen concerned with traffic problems, to city and state officials, to teachers and to newspaper writers on traffic and highway problems as well as to the professional highway traffic engineer. This detracts in no way from its effectiveness.

Accidents, the author states are not due so much to poor driving as they are to inefficient highway design. Similarly, he sets congestion down as another sign of inefficient design or improper operation. To this end the book is directed to setting forth the physical means and operating methods that will take the hazards out of highways and will keep traffic moving at desirable speeds and with the least amount of "friction." The author strongly opposes efforts to attack the accident problem by increasing congestion through complicated control, the chief result of which is more congestion. He advocates greater simplification of control, especially elimination of confusing control methods or devices, which distract drivers and so increase the accident hazard. He is a strong advocate of channelization at all intersections and devotes a large part of the book to that subject. Reduction of the points of friction between opposing or merging streams of traffic, he holds, will reduce the accident rate and speed the movement of traffic, which should be the major objectives of all traffic control.

The author urges that a rational approach be made to the speed problem with the objective of attaining higher safe speeds.

Municipalities in War

NATIONAL TECHNOLOGICAL CIVIL PROTECTION COMMITTEE—Appointed by the Secretary of War. Limited distribution. War Department, Washington, D. C.

Authentic information on the problems involved in maintaining municipal services in time of war is summarized in this report of American observers in Great Britain. Among the subjects discussed are: sanitation and public health, power, structures, transport and emergency control.

Miscellaneous Notes on Booklets and Reprints

CURRENT WORK ON THE PANAMA CANAL is described in a pamphlet entitled "The Third-Locks Project." Copies may be obtained from The Panama Canal, Balboa Heights, Canal Zone. Price 10c.

SHIPBUILDING AND MARINE ENGINES, a list of books and pamphlets on these subjects, has been published by the American Library Association, 520 N. Michigan Ave., Chicago, as Part II of the July 1, 1941, issue, of "The Book List." Single copies 25c.

MATHEMATICAL TABLES compiled by the Mathematical Table Project of the Work Projects Administration, are listed in a pamphlet that is available from the New York office, 70

Columbus Ave., or from the director of the National Bureau of Standards, Washington, D. C. Tables compiled by this project are designed to supply fundamental information not generally available in books on mathematics, physics, chemistry and engineering.

USE OF ALUMINUM IN DEFENSE INDUSTRIES, a bibliography of references to books and articles on that subject, has been published by the Aluminum Company of America, Pittsburgh, Pa., as No. 1 of Aluminum Service Bulletin. Included are references to books and articles on structural uses of aluminum.

BOMBER FLYING FIELDS is the title of a pamphlet just put out by the Asphalt Institute, 801 Second Ave., New York, as Construction Series No. 59. It gives information on present-day requirements and methods of constructing bituminous pavements for runways of flying fields where bombers are to operate.

PROGRESS MADE in ten years of study of fissures in railroad rails was recorded in the seventh progress report of the joint investigation of fissures in railroad rails to the American Railway Engineering Association at its meeting in March. The report now has been reprinted as Engineering Experiment Station Reprint Series No. 21, University of Illinois, Urbana, Ill. Price, 15c.

AN HISTORICAL and statistical record of the development of highways in Missouri has been published by the Missouri State Highway Department to bring together in convenient form background material that may be of value to people studying the recent Highway Planning Survey Report of the department. This information has been published by the department (Jefferson City, Mo.) in mimeographed form under the title of "Missouri Highways." Distribution is limited.

TWO PAPERS ON FISHWAYS were published recently by the University of Iowa. The first, An Investigation of Fishways, records the results of studies begun at the Iowa Institute of Hydraulic Research in December, 1937, at the request of the Iowa Conservation Commission. It reports both model and full-scale studies of numerous types of fishways. When these studies were begun a bibliography of published material on fishways was prepared, but it was not included in the published report of the studies. It now has been published under the title An Annotated Bibliography of Fishways. Copies may be obtained from E. W. Lane, associate director, Iowa Institute of Hydraulic Research, Iowa City, Iowa. Price on application.

New Engineering Books

AMERICAN ROAD BUILDERS' ASSOCIATION—Convention Proceedings, 1941. 819 pp. International Bldg., Washington, D. C. Price $10.

SANITARY ENGINEERING—By Harry G. Payrow. 483 pp. International Textbook Co., Scranton, Pa. Price $4.

ANUARIO DOS SERVICOS HIDRAULICOS 1936—May be obtained from the Ministerio das Obras Publicas d Communicacoes, Direccao Geral dos Servicos Hidraulicos e Electricos, Lisbon, Portugal.

PROCEEDINGS OF THE THIRTEENTH NATIONAL ASPHALT CONFERENCE, 1940—The Asphalt Institute, 801 Second Ave., New York. Price $1.

TRAFFIC ACCIDENTS AND CONGESTION—By Maxwell Halsey. 408 pp. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London. Price $4.

PHOTOELASTICITY—Vol. 1—By Max M. Frocht. 411 pp. John Wiley & Sons, New York; Chapman & Hall, London. Price $6.

TRAFFIC SURVEY MANUAL—108 pp. National Conservation Bureau, 60 John St., New York. Price $2.

CITY TRAFFIC ENGINEERING DEPARTMENTS—63 pp. Institute of Traffic Engineers, 60 John St., New York. Price 50c.

THE ENGINEERING PROFESSION—By Theodore J. Hoover and John C. L. Fish. 441 pp. Stanford University Press, Stanford University, Calif., and Oxford University Press, London. Price $5.

STEEL SQUARE POCKET BOOK—By Dwight L. Stoddard. Sixth Edition. Revised and enlarged. 183 pp. Scientific Book Corp., New York. Price $1.

MODERN HIGHER PLANE GEOMETRY—By Arthur S. Winsor, 214 pp. The Christopher Publishing House, Boston, Mass. Price $2.25.

DIESEL ENGINE OPERATION—96 pp. Chemical Publishing Co., Inc., Brooklyn, N. Y. Price $2.

MECANICA ECONOMICA—Vol. I, Mecanica Economica ao alcance de todos; Vol. III, Mecanica Economica Brasileira. By Felippe dos Santos Reis. Published by the author, Rio de Janeiro, Brazil.

GENERAL CHEMISTRY—By Harry N. [illegible]. Fourth Edition. 720 pp. The Macmillan Co., New York. Price $3.75.

Reports and Pamphlets

COUNTY OF WAYNE—34th Annual Report of the Board of Road Commissioners, Detroit, Mich.

WALTHAM, MASS.—Annual Reports of the Dept. of Public Works and Board of Survey and Planning, 1940.

RICHMOND, VA.—Annual Report of the Director of Public Works, 1940.

AS DEFORMACOES DO CONCRETO E A TEORIA DE FREYSSINET—By Telemaco van Langendonck. Departmento de Estradas de Rodagem, Sao Paulo, Brasil.

ALABAMA—29th Annual Report of the State Highway Department, Bulletin No. 40, 1940.

TWO-HINGED RECTANGULAR ARCH HAVING VARIABLE MOMENT OF INERTIA—Research Series No. 79. Engineering Experiment Station, Lafayette, Ind. Price 25c.

PROCEEDINGS, TWENTY-SEVENTH ANNUAL ROAD SCHOOL—Purdue University Extension Series No. 50. Engineering Extension Dept., Lafayette, Ind.

THE RESISTANCE TO COMBINED FLEXURE AND COMPRESSION, OF SQUARE CONCRETE SECTIONS—By Paul Anderson. Technical Paper No. 29. Engineering Experiment Station, University of Minnesota, Minneapolis, Minn.

HIGHWAY DEVELOPMENT—First Short Course on Roadside Planning. Bulletin No. 109, Engineering Experiment Station, Ohio State University, Columbus, Ohio. Price 60c.

MACHINERY AND SUPPLIES INDUSTRY SESSIONS—Minutes of the 46th Annual Credit Congress of the National Association of Credit Men, New Orleans, La.

OCCUPATION HAZARDS AND DIAGNOSTIC SIGNS—Bulletin No. 41, Division of Labor Standards, U. S. Dept. of Labor. Supt. of Documents, Washington, D. C. Price 10c.

1941 LAWS BULLETIN—No. 4—A digest of New Legislation Affecting Highway Users. National Highway Users Conference, National Press Bldg., Washington, D. C.

TAX FACTS AND FIGURES—The Tax Foundation, 30 Rockefeller Plaza, New York.

PORTLAND WATER DISTRICT—34th Annual Report, 1940, Portland, Maine.

ST. LOUIS, MO.—Annual Report of the Water Commissioner, 1941.

TOUGH AS A BULLDOG...

...supple as a greyhound

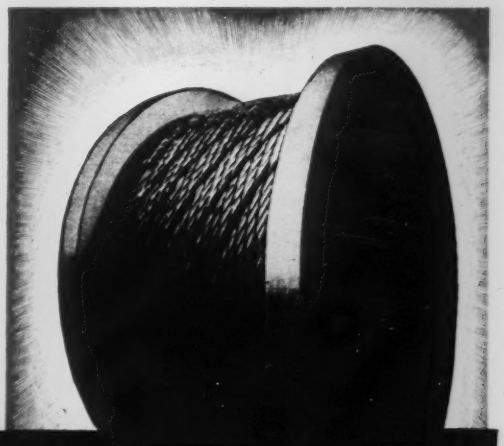
Two unusual qualities are combined in Purple Strand Form-set wire rope: rugged toughness and pliant ease.

Purple Strand is made of the toughest steel used in wire rope—Improved Plow. Then this tough rope is preformed (every strand permanently shaped into its helical position as the rope is being made). As a result, Purple Strand Form-set is relaxed, easy to handle. Broken wires won't wicker. No seizing is necessary when the rope is cut or spliced. Fatigue-resistance is improved. Purple Strand Form-set is our top-notch rope. Try it.

PURPLE STRAND

FORM-SET

WIRE ROPE



BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

WATER SUPPLY AND SEWERAGE SYSTEMS, CALIFORNIA

OWNER: Bureau of Reclamation, Sacramento, Calif.

PROJECT: Construction of water supply and sewerage facilities for sidings No. 1, 2, 4 and 6 of the relocated Southern Pacific Railroad, Kennett Division, Central Valley Project, California. Work located between Delta and Redding, Calif. Involves pipe line, well, pumping plants, chlorinating units, concrete dam, locomotive water supply columns, septic tanks and disposal fields. Natural-rock asphalt surfacing to be placed between tracks and about station buildings at sidings No. 2 and 6. Road to be constructed from main highway to buildings at siding No. 4, and to be surfaced with rock taken from spoil banks in vicinity of road.

CONDITIONS: Contractor to furnish gravel, rock, backfill materials, form materials, wire, water, insulating tape and compounds, and all other materials not part of completed structure. Government to furnish all other materials. Work to be completed in 170 calendar days. Rail and highway transportation facilities available. Wage rates specified as minimums are: skilled labor, $1.10 to $1.75 per hr.; semi-skilled, 82c. to $1.25; common, 75 to 80c.

BIDS: Four bids were opened August 29, 1941, ranging from the low of $100,089 to $169,142.

LIST OF BIDDERS:

1. Scheumann and Johnson, Eureka, Calif. $100,089
2. Loveland & Co., Ltd., San Francisco, Calif. 149,305
3. R. G. Clifford, C. M. Elliott, and Stroud-Seabrook, South San Francisco, Calif. 152,778
4. E. T. Haas Co., San Francisco, Calif. 169,142

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Common excavation, road	1,200 c. y.	$1.00	$0.56	$0.60
2. Place road surfacing	330 c. y.	1.00	.24	.70
3. Cr. gravel or cr. rock base crse. for surf.	230 c. y.	6.00	9.55	5.00
4. Watering	5 M gal.	4.00	23.88	15.00
5. Place natural-rock asph. surf.	160 c. y.	6.00	11.14	4.50
6. Apply seal coat	1,850 s. y.	.20	.16	.06
7. Excav., all classes; tunnels, shaft	190 c. y.	20.00	52.53	80.00
8. Excav., common; for pipe trenches	5,000 c. y.	2.25	3.58	4.00
9. Excav., rock; for pipe trenches	1,400 c. y.	2.25	7.96	4.00
10. Com. excav.; drain. ditches at disp. fields	200 c. y.	2.00	3.58	2.50
11. Com. excav.; struct., except pump plant inlets	1,050 c. y.	3.00	3.98	3.00
12. Rock excav.; as above	415 c. y.	4.00	7.96	7.00
13. Com. excav.; pump plant inlets	1,625 c. y.	4.00	4.76	3.00
14. Rock excav.; pump plant inlets	750 c. y.	4.00	4.76	8.75
15. Backfill of pipe trenches	4,940 c. y.	.50	1.83	1.60
16. Backfill about structures	2,400 c. y.	.50	.80	.75
17. Compact backfill in pipe trenches	2,270 c. y.	1.00	2.39	1.60
18. Compact backfill about structures	105 c. y.	2.00	2.39	1.60
19. Rock fills	320 c. y.	5.00	4.76	5.20
20. Concrete in structures	790 c. y.	25.00	39.40	42.00
21. Conc. in tunnels and shaft	80 c. y.	50.00	63.67	65.00
22. Place reinforcement bars	26,600 lb.	.03	.06	.04
23. Lay 54-in. corr. metal pipe	70 l. f.	2.00	2.39	5.00
24. Lower exist. culvert under railroad	L. S.	300.00	796.00	500.00
25. 8-in. perf. corr. met. pipe drains	200 l. f.	2.00	3.18	2.50
26. Lay 8-in. c. i. soil pipe, calked joints	75 l. f.	1.50	.80	1.00
27. Lay 6-in. c. i. soil pipe, calked joints	230 l. f.	1.50	.80	1.00
28. Lay 4-in. c. i. soil pipe, calked joints	240 l. f.	1.50	.80	.80
29. Lay 8-in. clay sew. pipe, poured joints	240 l. f.	.30	.64	.50
30. Lay 6-in. clay sew. pipe, poured joints	1,500 l. f.	.30	.64	.50
31. Lay 4-in. clay sew. pipe, poured joints	1,110 l. f.	.20	.64	.45
32. Lay 4-in. drain tile, embedded in grav.	2,910 l. f.	.80	1.83	.50
33. Lay 8-in. welded steel pipe	17,600 l. f.	.50	.25	.70
34. Lay 6-in. welded steel pipe	5,300 l. f.	.40	.25	.65
35. Lay 6-in. galv. steel pipe	465 l. f.	.60	.80	2.00
36. Lay 4-in. galv. steel pipe	4,850 l. f.	.30	.48	.80
37. Lay 3-in. galv. steel pipe	50 l. f.	.50	.48	.50
38. Lay 2½-in. galv. steel pipe	770 l. f.	.40	.48	.20
39. Lay 2-in. galv. steel pipe	620 l. f.	.30	.48	.15
40. Lay 1-in. galv. steel pipe	60 l. f.	.50	.32	.15
41. Lay ¾-in. galv. steel pipe	150 l. f.	.50	.32	.15
42. Lay 12-in. c. i. water pipe, calked jts	480 l. f.	1.50	1.59	2.30
43. Place air and vacuum valves	3 ea.	15.00	15.92	10.00
44. Place 12-in. gate valves	6 ea.	20.00	23.88	18.00
45. Place 8-in. gate valves	3 ea.	20.00	15.92	12.00
46. Place 6-in. gate valves	3 ea.	20.00	15.92	8.00
47. Place 4-in. gate valves and boxes	17 ea.	14.00	15.92	4.00
48. Place 2½-in. gate valves and boxes	1 ea.	15.00	11.94	4.00
49. Place 2-in. gate valves and boxes	2 ea.	15.00	11.94	3.00
50. Place 6-in. check valve	1 ea.	15.00	15.92	8.00
51. Place altitude-control valve	2 ea.	75.00	79.60	15.00
52. Place fire hydrants	13 ea.	30.00	55.71	22.00
53. Well at siding No. 2, except conc. and reinf.	L. S.	2,500.00	796.00	2,000.00
54. Pump house at siding No. 1 pump plt.	L. S.	300.00	334.00	300.00
55. Pump house at siding No. 2 pump plt.	L. S.	200.00	231.00	150.00
56. Pump house at siding No. 6 pump plt.	L. S.	500.00	557.00	360.00
57. Hose-reel boxes, complete	13 ea.	50.00	39.80	15.00
58. Erect timber in structures	11.7 M bm.	50.00	79.60	75.00
59. Inst. std. steel and c. i. pipe, fittings and valves	7,800 lb.	.15	.10	.15
60. Install pumping units	5,500 lb.	.10	.24	.15
61. Install chlorinating units	1,400 lb.	.20	.24	.10
62. Install water columns	15,750 lb.	.08	.08	.06
63. Install miscellaneous metalwork	9,850 lb.	.10	.11	.12
64. Inst. electrical metal conduit	160 l. f.	1.00	1.59	.20
65. Inst. electrical conductors	1,800 lb.	.50	.16	.30
66. Install electrical apparatus	700 lb.	1.00	.40	.50

WALLACE LAKE DAM LOUISIANA

OWNER: U. S. Engineer Office, Vicksburg, Miss.

PROJECT: Construction of rolled fill earth dam and concrete spillway 4,940 ft. long, on Cypress Bayou, in Caddo and DeSoto Parishes, about 14 miles southeast of Shreveport, La. Involves preparation of site; rolled fill embankment of dam, the major part of which is to be composed of impervious material from borrow pits and spillway excavation; spillway and channel excavation; concrete spillway of ogee gravity type, 644 ft. wide, incorporating battery of four outlet conduits designed to discharge a combined maximum of 2,600 c.f.s. Trash racks to be provided. Spillway and outlet discharge into concrete lined stilling basins. Abutment walls to be concrete, of the counterfort and cantilever types.

CONDITIONS: Contractor to furnish all materials and complete work in 365 calendar days. Railway and highway transportation facilities available. Wage rates specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled 35 to 75c; and common labor 35c.

BIDS: Two bids were opened June 25, 1941, the contract low of $786,369 and $1,006,395. Estimated cost, $642,330.

LIST OF BIDDERS:

1. Newson Bros. & J. W. Snowden, Columbia, Miss. $786,369
2. Forcum-James Co., Dyersburg, Tenn. 1,006,395

Item	Quan.	Unit Prices (1)	(2)
1. Preparation of site	L. S.	$6,500.00	$6,000.00
2. Stripping	6,800 c. y.	.30	.50
3. Excavation, spillway	120,600 c. y.	.27	.55
4. Excavation, channel	47,400 c. y.	.25	.30
5. Excav.; borrow area "A"	105,400 c. y.	.25	.30
6. Excav.; borrow area "B"	314,900 c. y.	.22	.30
7. Excav.; borrow area "C"	29,100 c. y.	.24	.30
8. Rolled fill, impervious	541,000 c. y.	.13	.06
9. Rolled fill, relatively pervious	21,500 c. y.	.13	.06
10. Rolling for add'l. 2 passes	500,000 sq.	.02	.03
11. Sand fill	2,340 c. y.	4.60	3.50
12. Topsoil	2,800 c. y.	.55	.75
13. 6-in. perf. corr. pipe drains	1,800 l. f.	1.00	2.00
14. Gravel for drains and filter beds	2,450 c. y.	5.50	3.00
15. Spot sodding	111,700 s. y.	.03	.15
16. Hand placed riprap	3,140 c. y.	9.00	12.00
17. Derrick stone	3,770 c. y.	9.00	12.00
18. Steel sheet piling	15,520 s. f.	1.17	2.00
19. Timber bearing piles, battered	9,230 l. f.	.70	1.35
20. Timber bearing piles, vertical	92,070 l. f.	.65	1.15
21. Pile loading test, vertical, single	6 ea.	200.00	300.00
22. Pile loading test, vertical, group	1 ea.	600.00	1,500.00
23. Pile loading test, horizontal, single	4 ea.	100.00	250.00
24. Class B concrete in walls	2,475 c. y.	18.00	23.00
25. Class B concrete in spillway weir	12,340 c. y.	16.00	19.00
26. Class B concrete in stilling basins, pavements and conserv. weir	4,800 c. y.	16.00	20.00
27. Class A concrete in trash rack	50 c. y.	55.00	50.00
28. Steel reinforcement	604,100 lb.	.055	.06
29. Copper water stops	4,270 lb.	.75	.75
30. Wire fence	165 l. f.	3.50	5.00
31. Pipe guard rail	154 l. f.	5.00	5.00
32. 3-in. galv. wr. iron pipe	1,780 l. f.	1.00	2.50
33. Gaging stations	L. S.	3,000.00	10,000.00
34. Water level recorders	2 ea.	400.00	450.00
35. Engineering field office	L. S.	3,000.00	12,000.00

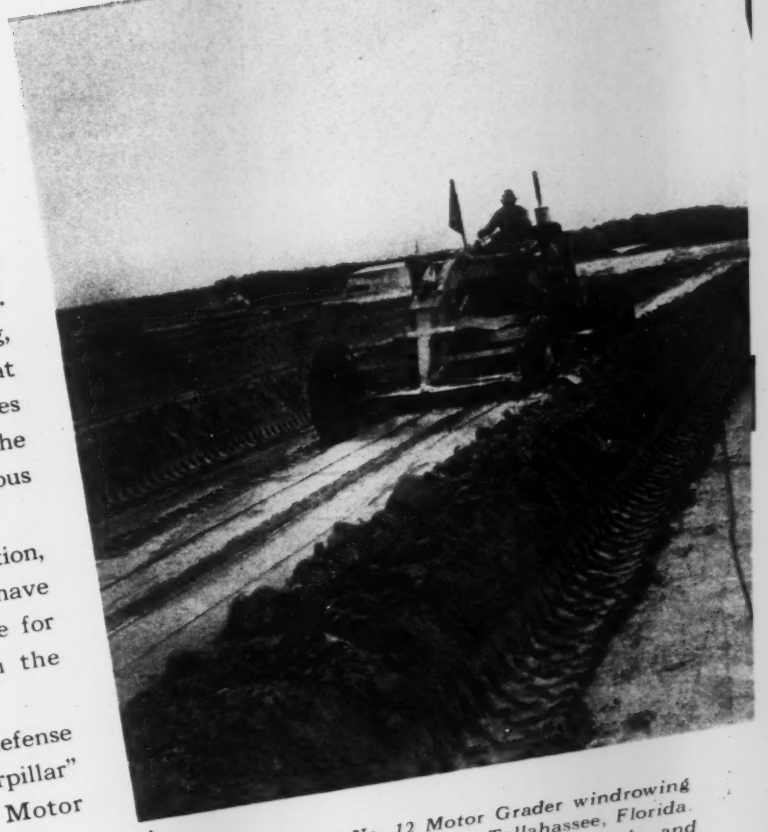
# of Efficient Grading

ONE of the big reasons why "Caterpillar" Diesel Motor Graders are first choice on American roads is their *traction.* Watch one of those big No. 12s ditching, scarifying or spreading rock. You'll see that all the weight of the husky engine rides squarely over the low-pressure tires on the driving wheels—gives them tremendous gripping power on almost any surface.

Because of their unparalleled traction, "Caterpillar" Diesel Motor Graders have huge blade capacity and an appetite for fast, steady, economical work on the toughest jobs.

When America plunged into the defense effort, the first call was for "Caterpillar" Diesel Tractors, Engines and Motor Graders. These machines, which have done so much to give the United States the finest system of roads and streets in the world, are today pitching in to help protect it.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS



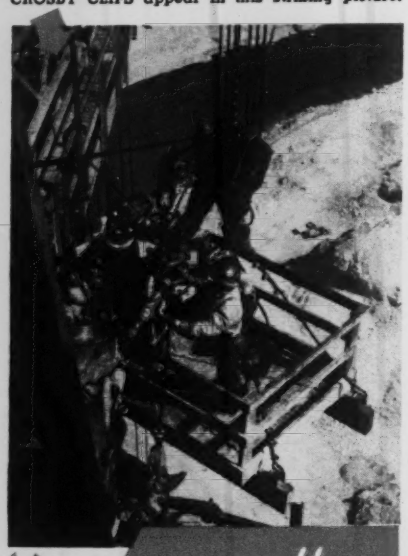
"Caterpillar" Diesel No. 12 Motor Grader windrowing subgrade for the new Air Base at Tallahassee, Florida. Sure traction, quick-acting mechanical controls, and an unequaled range of blade positions make this machine the favorite on defense airport work—as well as on civilian roads and airports.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINER

Riggers attaching one of the half-mile-long 3-inch main cableways to the head tower. The work is being handled from a scaffold suspended from the hook of the AMERICAN Pillar Crane which is permanently mounted on top of the 460-foot head tower. Notice how many CROSBY CLIPS appear in this striking picture.



"Yep a pretty lofty perch," BUT LOOK AT THE PROTECTION genuine CROSBY CLIPS"

When you work in a swinging scaffold hung from a "sky hook" 460 feet straight up, that's when you want to KNOW that the cable fastenings are one hundred per cent safe. The one sure way to KNOW is to standardize on Genuine CROSBY CLIPS.

Experienced riggers swear by the Genuine CROSBY CLIP because they know its dependability is proved by a 58-year safety record and that it has everything it takes to hold wire rope safely in any service: correct gripping design; generously proportioned drop forged steel base; over-size U-bolt and nuts; a thick anti-rust armor of zinc applied by the Hot Dip process.

Dealers with stocks of all sizes in all principal cities.

AMERICAN HOIST & DERRICK CO.

CHICAGO ST. PAUL, MINN. NEW YORK

AMERICAN TERRY DERRICK CO., SOUTH KEARNY, N. J.

MEETINGS

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, annual meeting, Statler Hotel, Detroit, Mich., Sept. 29–Oct. 2.

NATIONAL SAFETY CONGRESS AND EXPOSITION, National Safety Council headquarters, Chicago, Ill., Oct. 6–11, 1941.

FEDERATION OF SEWAGE WORKS ASSOCIATIONS, 2nd annual convention, Hotel Pennsylvania, New York, N. Y., Oct. 9–11, 1941.

FEDERATION OF ARCHITECTS, ENGINEERS, CHEMISTS & TECHNICIANS, 6th national convention, Detroit, Mich., Oct. 10–12.

AMERICAN PUBLIC HEALTH ASSOCIATION, Atlantic City, N. J., Oct. 13–17, 1941.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, annual convention, The Greenbrier, White Sulphur Springs, W. Va., Oct. 14–17, 1941.

AMERICAN SOCIETY OF CIVIL ENGINEERS, fall meeting, Palmer House, Chicago, Ill., Oct. 15–17.

CANADIAN INSTITUTE OF SEWAGE & SANITATION, 8th annual convention, Walper House, Kitchener, Ont., Oct. 16–17.

AMERICAN WELDING SOCIETY, Bellevue-Stratford Hotel, Philadelphia, Oct. 19–24, 1941.

AMERICAN PUBLIC WORKS ASSOCIATION, 47th annual conference, Roosevelt Hotel, New Orleans, La., Oct. 26–29, 1941.

NATIONAL COUNCIL STATE BOARDS OF ENGINEERING EXAMINERS, Hotel Pennsylvania, New York, N. Y., Oct. 27–30.

INDUSTRIAL HYGIENE FOUNDATION, 6th annual meeting, Mellon Institute, Pittsburgh, Pa., Nov. 12–13.

REGIONAL AND LOCAL MEETINGS

NORTH DAKOTA WATER & SEWAGE WORKS CONFERENCE, 13th annual meeting, Jamestown, N. D., Oct. 13–15.

ILLINOIS MUNICIPAL LEAGUE, 28th annual convention, Congress Hotel, Chicago, Ill., Oct. 15–17.

AMERICAN WATER WORKS ASSOCIATION, Minnesota Section, Minneapolis, Oct. 9–11; New Jersey Section, Atlantic City, N. J., Oct. 16–18.

MISSOURI SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Hotel Statler, St. Louis, Mo., Oct. 17–18.

WEST VIRGINIA SOCIETY OF PROFESSIONAL ENGINEERS, Bluefield, W. Va., Oct. 23–25.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Hotel Niagara, Niagara Falls, N. Y., Oct. 24–25.

ILLINOIS WATER PLANT OPERATORS, 9th annual fall meeting, Leland Hotel, Springfield, Ill., Oct. 28–29.

WATER AND SEWAGE WORKS CONFERENCE, 7th annual meeting, Aberdeen, S. D., Oct. 28–29, 1941.

TEXAS SECTION, Am. Soc. of C. E., fall meeting, Fort Worth, Oct. 31–Nov. 1.

ENGINEERING SOCIETY OF WESTERN PENNSYLVANIA, annual conference, William Penn Hotel, Pittsburgh, Nov. 3–4.

NORTH CAROLINA SECTION, American Water Works Association, High Point, N. C., Nov. 3–5.

ILLINOIS ASSOCIATION OF HIGHWAY ENGINEERS, 1941 convention, Abraham Lincoln Hotel, Springfield, Ill., Nov. 9.

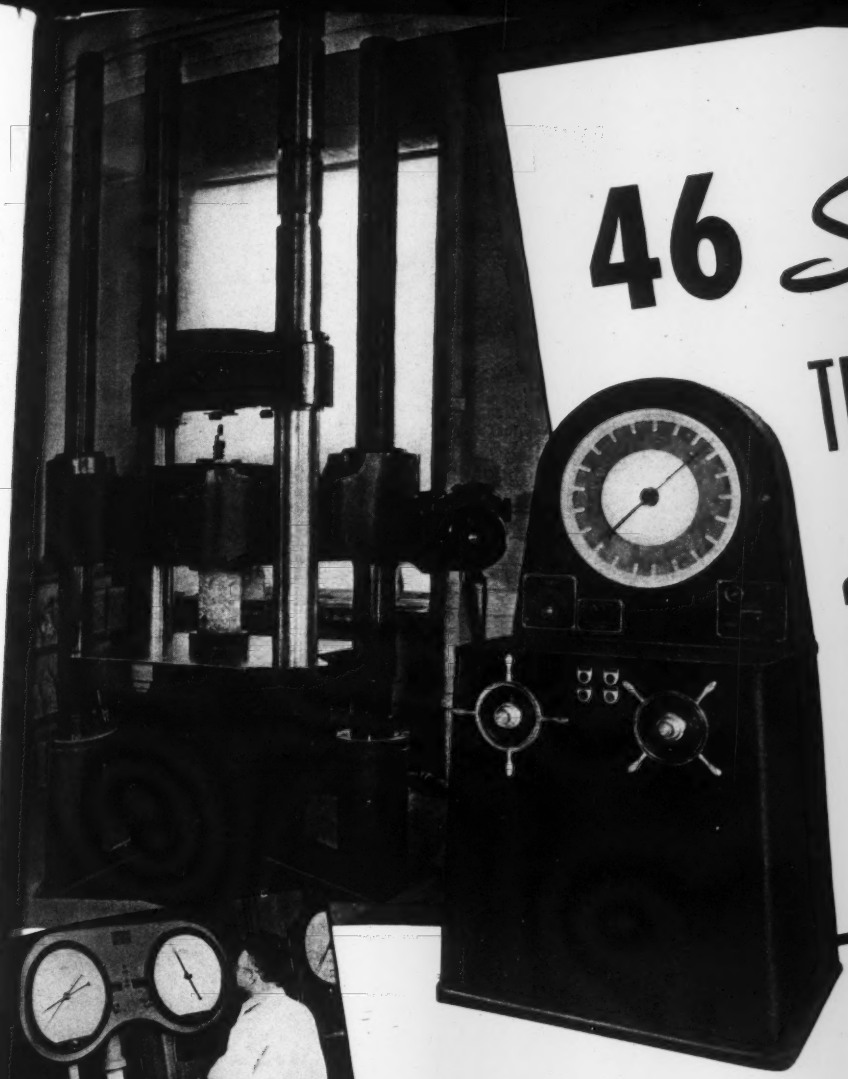
ELECTIONS AND ACTIVITIES

F. DEWITT O'DELL, engineer of Oswego County (N. Y.) and superintendent of highways, has been appointed district contact representative by the American Road Builders Association to represent the counties comprising the northeastern district of the County Highway Officials Division of the ARBA. The northeastern division comprises ten states. The appointment was made by John A. Long, assistant engineering director of the American Road Builders Association.

FRED SCHRADER, of Sioux Falls, S. Dak., has been elected president of the South Dakota State Association of County Highway Superintendents. Other officers elected at the annual convention held in Hot Springs, Sept. 9, are: Earl Hamilton, of Sturgis, vice-president and Charles H. Sinclair, of Huron, secretary-treasurer.

H. K. FERGUSON & CO., industrial engineers and builders of Cleveland, Ohio, have opened an office in the Commerce building, Houston, Tex., to serve the southwest. Gilbert E. Olson has been named manager.

ABOUT 200 engineers, operators and municipal officials, particularly interested in the field of sewage treatment, met at Mansfield, Ohio, Sept. 18–19, for the 15th annual conference on sewage treatment. J. R. Turner, superintendent of the Mansfield sewage treatment plant directed arrangements for the conference. Besides a number of interesting technical papers on various phases of sewage treatment, a forum session for the exchange of ideas and general information was conducted. When this group of sewage treatment men was organized in 1927 there were only 91 Ohio cities being served by 79 treatment plants. By 1940 there were 209 cities being served by 182 plants, and today 193 plants now serve about 65 per cent of the population in the area covered by activities of this group.



46 Southwark TESTING MACHINES in 30 STATE HIGHWAY LABORATORIES

(Southwark-Emery cement testing machines are the accepted standard of the industry. 108 of these compression machines are in active service today.)

Meeting the requirements for accuracy, speed, versatility and quietness of operation — so important in highway and construction research — Southwark-Emery Universal and compression testing machines have gained national acceptance as evidenced by their widespread use in state highway laboratories.

Routine tests for the determination of the tensile strength of steel, the compressive strength of concrete and beams, the deformation load on guard rail springs, soil stability studies, etc., are accurately and rapidly made on Southwark-Emery hydraulic machines.

Products of research, Southwark-Emery testing machines represent the most recent and most important development in physical testing equipment.

Baldwin-Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco.

Baldwin Southwark

DIVISION OF THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

BLW
THE BALDWIN GROUP

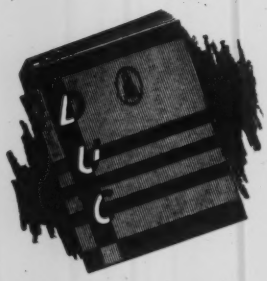
MAYBE THAT BUILDING OF YOURS ISN'T *Washed Up* AFTER ALL . .

● The chances are, with the help of Detroit Underpinning engineers, your present facilities can be restored to insure soundness for today and for the future and can be changed to suit your needs.

Problems like the following may be confronting you now—the ground under footings may have sunk, causing a dangerous settlement in the building itself. You may be overloading a column or wall to the point where severe stresses are occurring, movement is taking place, or an actual failure is imminent. The introduction or realignment of heavy machinery for defense production may put a strain on your foundations which may cause trouble, now or later. Whatever problem your inspection reveals, our engineers will be able to offer you helpful suggestions.

In addition, we raise or lower buildings; shore roofs, floors, walls, banks, tunnels; move buildings or heavy equipment. If your buildings or structures can be made more sound by any of these specialized operations, call us. The experience of our engineers may be able to save you grief, time, and money.

Find out what we can do to save you building money.



This new booklet, now in preparation, will illustrate various types of our work. Although not a complete story it will show how we have helped to keep many structures in active service —write for a copy.

★

The photograph illustrates one of the many types of buildings which it has been found profitable to move—with new street layouts it was a great advantage to have the main entrance and store fronts of this building facing in another direction. An increase in revenue was immediately possible after the building was relocated and the entire value of the structure was preserved—the cost of this complete operation was surprisingly low.

★

MOVING • SHORING • RAISING • FOUNDATIONS • UNDERPINNING • CAISSONS • PLANT RELOCATION

DETROIT UNDERPINNING COMPANY

OFFICE AND MAIN YARD 9121 ALPINE DETROIT, MICH.

MEN AND JOBS

P. H. Barnes, Jr., Raleigh, N. C., has just been named area planning engineer of the Public Work Reserve for North Carolina. Mr. Barnes is a graduate of North Carolina State College and studied at V.P.I. and Harvard University. He has been with the North Carolina state highway and public works commission in various capacities since 1931.

M. C. Connoly of Engadine, Mich., assistant Dickenson county engineer from 1924 to 1930, has new duties as engineer and superintendent of the Dickenson County (Mich.) road commission, succeeding **James A. Clulo,** who has resigned.

William C. E. Becker, former chief engineer of bridges and buildings of the city of St. Louis, has resigned to return to practice as a consulting engineer specializing in building construction, with offices in the Ambassador Building, St. Louis, Mo.

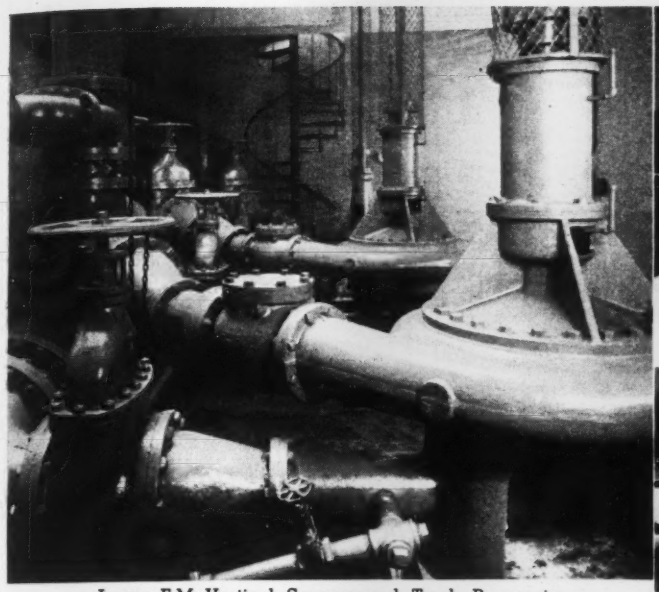
Maj. R. L. Wayman has succeeded **Lieut. Col. W. H. Blake** as Canadian district engineer officer for military district No. 7, comprising the province of New Brunswick, with the base at St. John.

C. N. Joyner is now senior business specialist in the production division of OPM. During the cantonment construction period Mr. Joyner was Washington representative for a group of construction contractors. He was formerly with T. L. James & Co. of Ruston, La. and for a number of years was with the British Municipality at Tientsin, China, as assistant, chief assistant, deputy and municipal engineer.

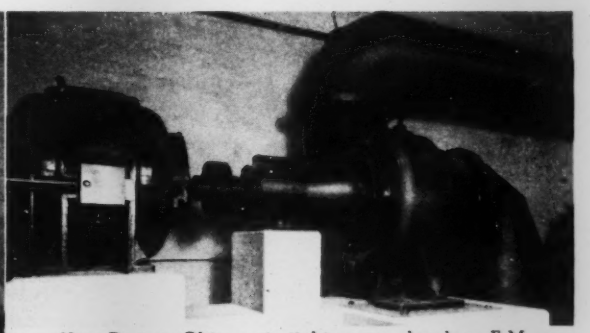
Clifford M. Maratta, chairman of the city water commission, Canton, Ohio, has been named as one of five members of an advisory committee to the Ohio water supply board, which has the task of compiling data on that state's available water supply. Mr. Maratta is an official of the Timken Roller Bearing Co.

The Indiana state highway commission has announced the following personnel changes: **Ray H. Bower,** district engineer of the Seymour district for the past several years, has been advanced to the post of assistant chief engineer; he will serve as assistant to **M. R. Keefe,** whose title has been changed from chief engineer to chief engineer in charge of construction. Mr. Keefe formerly held the

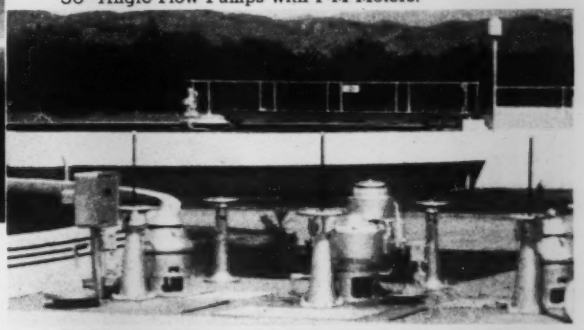
(*Continued on p.* 100)



Large F-M Vertical Sewage and Trash Pumps in service at Long Beach, Calif.



New Boston, Ohio, watertight pump chamber. F-M 36″ Angle Flow Pumps with F-M Motors.

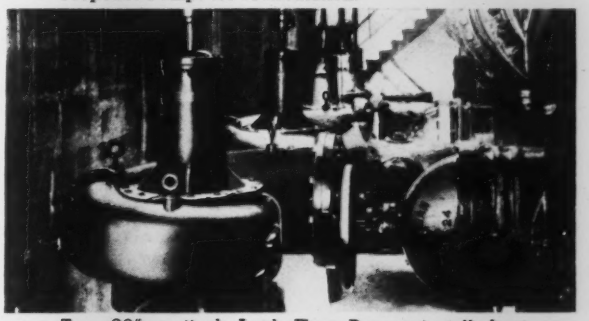


Biofiltration Plant at Santa Paula, Calif., uses F-M Propeller Pumps for recirculation.

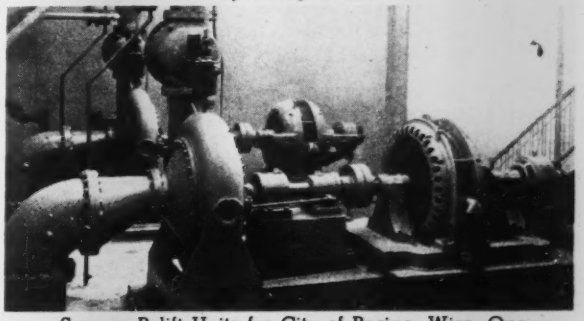
SEWAGE PUMPS
FROM COAST TO COAST

of progress in the development of equipment for the nation's commerce and industry.

A somewhat recent acknowledgment of F-M Sewage Pump superiority was the ready acceptance of F-M Pumps for the Biofiltration Process of Sewage Treatment. Fairbanks-Morse Hydraulic Engineers, specialists in Sewage and Trash handling are always available for collaboration and consultation on all pumping problems, without cost or obligation. Write Dept. 29, Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.



Two 20″ vertical Angle-Flow Pumps installed at Cleveland's Easterly Sewage Plant.



Sewage Relift Units for City of Racine, Wisc. One 14″ and one 12″ pump connected to F-M Motors.

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(*Continued from p. 96*)

same position but resigned last winter. **Earl B. Lockridge** was promoted to his position. Mr. Lockridge was called to army duty in August and Mr. Keefe returned to his old job. **C. W. McClain** of Plainfield, formerly a maintenance engineer with the commission, was named district engineer of the Seymour district, succeeding Mr. Bower. **Theron Coffell,** promoted from project engineer to assistant district engineer of maintenance in the Crawfordsville district; **O. W. Eufey,** from acting to permanent district engineer of bridges in the Ft. Wayne district, and **Dick Boch,** from acting to permanent superintendent of the Waterloo sub-district.

A. B. Sansbury, of Timmonsville, S. C., has been appointed city manager of Goldsboro, N. C., to replace Zeno Hollowell, resigned.

T. J. Fowler, former project engineer in charge for the past two years of the PWA Zone office in St. Paul, Minn., has been assigned to the Chicago office. After nine years of maintenance the St. Paul office has been closed, and work remaining in Minnesota will be handled from Chicago.

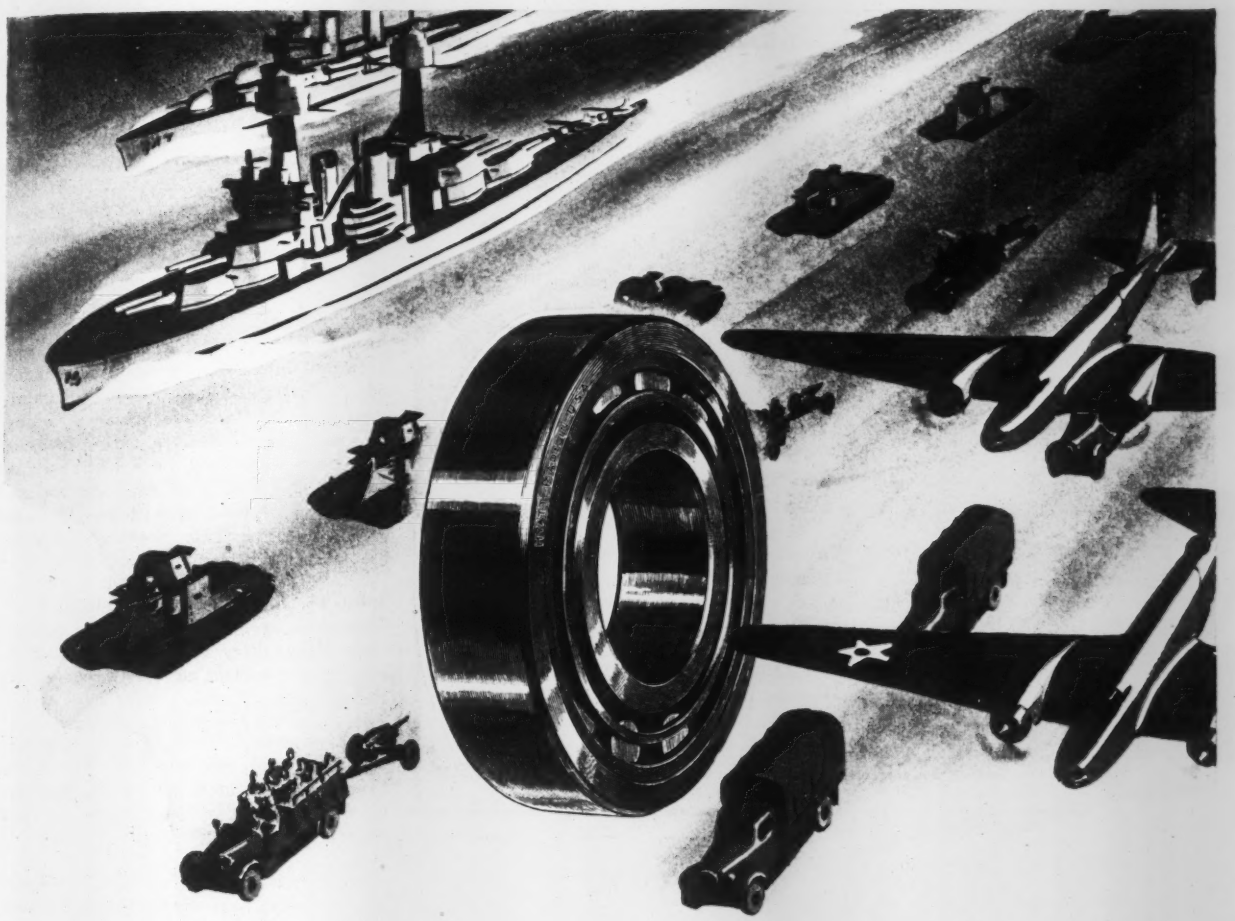
Pennsylvania's department of highways has announced the appointment of **Lee R. Daugherty** of Curwensville as project engineer, District 2, with headquarters at Clearfield; **Ernest D. Clapp,** of Kennett Square, is resident engineer for District 6, with headquarters at Ardmore.

F. C. Weiss, formerly manager of the engineering and construction department of the Alabama Power Co. at Birmingham, has been elected a vice president. Mr. Weiss, a Texan, was graduated from the Massachusetts Institute of Technology in 1913 and entered the service of the company the same year.

E. F. Nelson, engineer in the division of statistics and analysis of the Arkansas state highway department, has been loaned to the Defense Contract Service as part-time engineer on priorities.

Albert Coope has been appointed Mahoning county (Ohio) sanitary engineer, succeeding **Chester V. Long.** Mr. Coope, now assistant sanitary engineer, has been employed in the division since it was formed in 1923. He has had charge of construction of most of the county's storm sewer system. Mr. Long will become chief deputy engineer under county engineer **Robert J. Schomer,** and will divide his time between the sanitary and the regular engineering department.

(*Continued on p. 102*)



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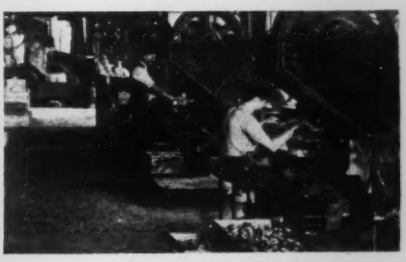
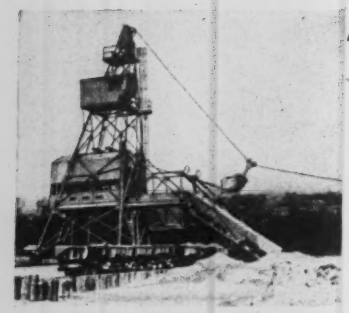
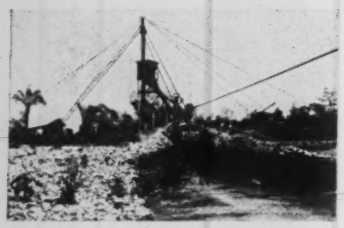


HYATT ROLLER BEARINGS

Carry the Load!



Sauerman Scraper Machine with travelling tower loads 200 cu. yd. of clay per hour from pit into cars.



Sauerman Slackline Cableway digs hard-packed gravel and conveys 35 loads per hour to screening plant.

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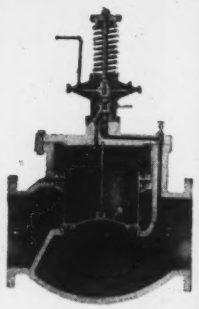

Where a separate discharge line or bypass arrangement is used for removing storage water, this valve, placed in the upstream pressure line, will maintain a uniform water level in tank, standpipe or reservoir within a range of 3" to 12" variation.

GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

(*Continued from p.* 100)

Arend Huisken has resigned as construction engineer from the Public Buildings Administration to accept a position as general construction superintendent for Goode Construction Corp., Blythe Brothers Co. and Harrison-Wright Co., operating as contractors on the Marine Barracks, New River, N. C. Mr. Huisken was engineer inspector for the Public Buildings Administration, Federal Works Agency, for six years—1934 to 1940.

Andrew R. Pastorius, Orange, Conn., has been appointed director of operations for the Connecticut Work Projects Administration. Mr. Pastorius has been acting director since February. He has been connected with WPA since 1935, serving as field engineer, area engineer and assistant director of operations. He was graduated from Yale Sheffield Scientific School, New Haven.

John D. Lange, assistant manager of Greendale, government housing project near Milwaukee, Wis., has resigned to accept a position as city manager of Palm Springs, Calif.

O. Y. Leonard, of Lewis & Leonard, architects and engineers, of New York City, is now located with F. H. McGraw & Co., contractors, Bermuda, as job engineer.

Fred Burggraf is now an assistant director of the highway research board of the National Research Council. Mr. Burggraf has been connected with research on highways since 1919. His career has included engagements with the National Bureau of Standards, the Illinois Division of Highways, the Highway Research Board and the Calcium Chloride Association.

W. H. Burke, member of the Dallas, Tex., public works staff for the past 30 years, will be in full charge of the engineering division operations in his new position as office engineer.

C. Van Gundy, Denver, Colo., has taken over the structural engineering practice of Shankland, Ristine & Co. of that city.

Robert H. Barclay, regional director of the Federal Power Commission of New York since 1936, has joined the engineering staff of the J. G. White Engineering Corp., New York, as electrical engineer in charge of the division of electrical engineering. Much of Mr. Barclay's career has been with firms engaged in the design and construction of public utilities. It includes the position of superintendent of buildings and power plants for the Bell Telephone Company of Missouri, and electrical

(*Continued on p.* 104)

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STRENGTH
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in a pipe line
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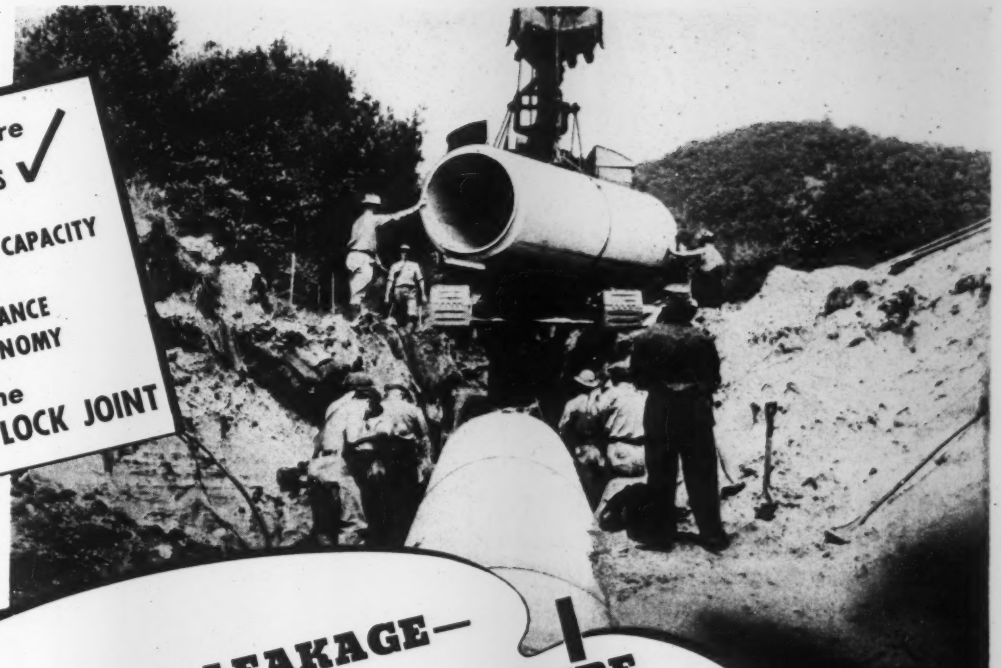

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LESS "DOLLAR DRIBBLING" HERE

Less leakage because this is a "Lock Joint"—a watertight joint and an expansion joint—one that permits movement due to temperature changes and earth settlement without creating stresses in the pipe wall and without leakage through the joint.

And—each section of Lock Joint Pipe is water-tight, too. It is not only designed with a high factor of safety for strength, but the reinforcing steel is embedded in and protected by rich, dense concrete to effectively resist corrosion and its attendant structural failure.

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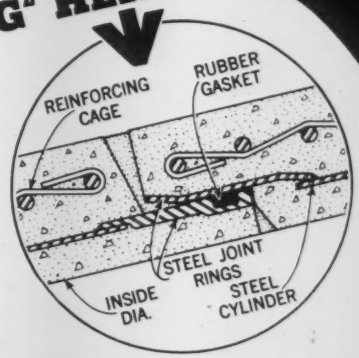

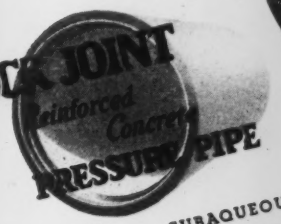

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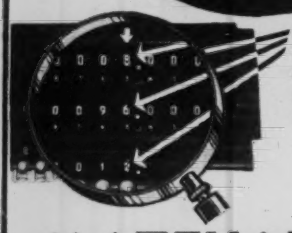

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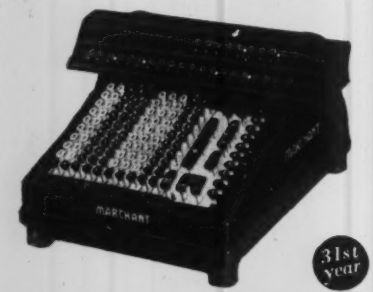

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Use margin of page if necessary.

(*Continued from p.* 102)

engineer for the Kansas City Terminal Railway Co., the Brooklyn-Manhattan Transit Corp., the Foundation Co., Starrett & Van Vleck, and the Stone & Webster Engineering Corp.

Norman Castellan, practicing engineer and professor of mathematics at the Colorado School of Mines at Golden, Colo., has resigned to accept a position with the Office of Production Management in the Denver district office. Prof. Castellan had been at the Colorado School of Mines during the past three years.

Donald C. Sutherland, engineer with the Colorado State Highway department for the past seven years, has resigned to accept a position with the Remington Arms Co. at their Denver Munitions plant in the capacity of progress engineer.

June Brock, operator of the sewage treatment plant at Duquoin, Ill., has been inducted into the army.

Capt. C. L. Bucknum has been transferred from Camp Shelby to Fort Bragg, N. C. as constructing quartermaster, one of the largest barracks-type camps. At Camp Shelby, **Lieut. Jack D. Daughaday,** former assistant to Capt. Bucknum, will replace him as constructing quartermaster.

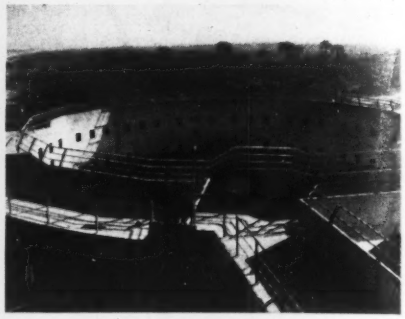
Frank M. Bunch, formerly project engineer of the Mississippi state highway department with headquarters in Calhoun City, is now assistant construction engineer with headquarters in the Jackson office. **Joe Sheppard** has been promoted to project engineer, with headquarters at Satartia, Miss., and **E. O. Granthan** is the new state highway department project engineer at Philadelphia, Miss.

Hugh J. McNanigal, civil engineer, is now general superintendent of a million-dollar housing project in Richmond, Va., for the Labornum Construction Corp. Mr. McManigal was formerly PWA resident engineer for Ohio, assistant division engineer for the Great Lakes Dredge & Dock Co., and has worked extensively on general construction operations in the Cleveland, Ohio, and South Bend, Ind., areas.

Capt. Richard S. Nelle, for four years in the stream pollution and sewerage department of the Illinois State Department of Public Health, is now in the army in the U. S. Corps of Engineers, having been a reserve officer for several years.

(*Continued on p.* 108)

"GUNITE" AT THE MARINE STUDIOS



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Our Bulletin 1200 illustrates and describes a great variety of uses for which "GUNITE" is the one best method of construction. Send for a copy today.

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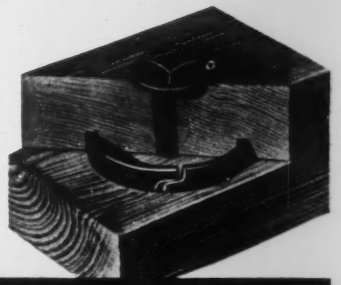

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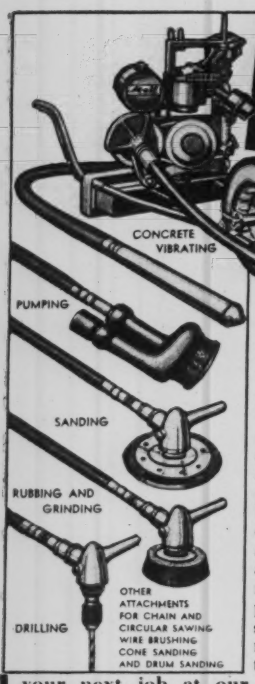

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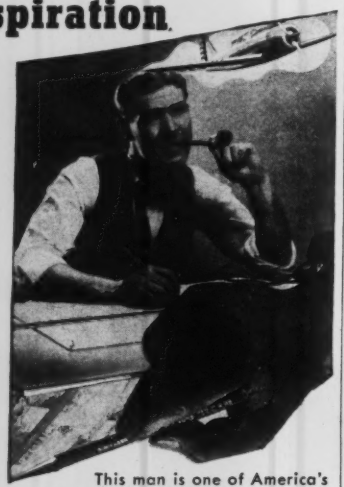

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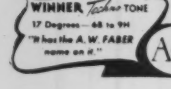

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(*Continued from p.* 104)

The following officers of the Civil Engineer Corps, U. S. Naval Reserve, have been called to active duty:

Lt. Comdr. Albert A. L. Ort, assistant manager of the Haitian American Development Corp., Cape Haitian, Haiti, to active duty in the Bureau of Yards and Docks, Navy Dept., Washington, D. C.

Lt. Frank B. Cressy, associate highway engineer, Dept. of Public Works, division of highways, Los Angeles, Calif., to duty at Headquarters, San Diego, Cal., Eleventh Naval District.

Lt. Lawrence A. Elsener, district manager, Chicago Bridge and Iron Co., San Francisco, Calif., to duty in the Bureau of Yards and Docks, Navy Dept., Washington, D. C.

Lt. Roy M. Harris, chief engineer, State Dept. of Health, Seattle, Wash., to duty at Headquarters, Thirteenth Naval District, Seattle, Wash.

Lt. Abraham Verduin, assistant engineer, structural division, Public Service Electricity and Gas Co., Newark, N. J., to duty at the Norfolk Navy Yard, Portsmouth, Virginia.

Lt. Deane E. Carberry, associate engineer, U. S. Bureau of Reclamation, Denver, Colo., to active duty at Headquarters, Twelfth Naval District, San Francisco, Calif.

Lt. George N. Newhall, assistant highway engineer, U. S. Forest Service, San Francisco, Calif., to active duty in the Bureau of Yards and Docks, Navy Dept., Washington, D. C.

Lt. Lloyd E. Root, of the Virginia Engineering Co., Newport News, Va., to active duty in the Bureau of Yards and Docks, Navy Dept., Washington, D. C.

Lt. William L. Sawyer, associate professor of civil engineering, University of Florida, Gainesville, Fla., to active duty at the Naval Air Station, Jacksonville, Fla.

Lt. Robert S. Thomas, associate engineer, U. S. Bureau of Reclamation, Sacramento, Calif., to active duty at Headquarters, Twelfth Naval District, San Francisco, Calf.

Lt. Roscoe E. Van Liew, associate engineer, U. S. Bureau of Reclamation, Salt Lake City, Utah, to active duty in the Bureau of Yards and Docks, Navy Dept., Washington, D. C.

MORE WORKING WEIGHT

... PUTS THE "99-M" POWER GRADER 'WAY OUT IN FRONT ON VARIETY *and* VOLUME OF YEAR 'ROUND PRODUCTION

A motor grader without power on the front wheels is like a draft horse with roller skates on his front feet.

● The ability of an A-W "99-M" to hustle from job to job . . . work in bad weather and difficult soil . . . do the work of two, three or more "part time" pieces of equipment in addition to all regular motor grader jobs . . . pays you an EXTRA WORK dividend of at least ONE MONTH each year.

This year 'round superiority of the "99-M" is largely due to the fact that—figured in terms of live tractive weight—it is the HEAVIEST motor grader on the market. There are no idling front wheels—carrying dead weight—to waste horsepower and limit its range of useful work.

Snow plowing provides one of many instances where the greater working weight of the "99-M" pays extra dividends. With powerful traction on the front wheels, plus steerable rear wheels, the "99-M" has unmatched bucking ability and control of direction. It successfully overcomes sidedraft; does not tend to skid into the ditch; follows curves and sharp intersections.

Ask for a demonstration and see for yourself what the "99-M's" greater working weight means in terms of year 'round performance, power saving, and extra range of usefulness. THE AUSTIN-WESTERN ROAD MACHINERY CO, Aurora, Ill.

MOTOR GRADERS
LOADERS
BLADE GRADERS
ELEVATING GRADERS
HYDRAULIC SCRAPERS
CRUSHING AND SCREENING PLANTS
CABLE SCRAPERS
ROLLERS
ROLL-A-PLANES
MOTOR SWEEPERS
BITUMINOUS DISTRIBUTORS
SHOVELS AND CRANES

Austin-Western

NO CINDER-BLITZ ON THIS BRIDGE !

Locomotives blast away with cinders, fumes and firebox gases . . . but this bridge is adequately protected. Asbestos-Bonded Armco Blast Plates ward off these damaging "low punches" before they can reach their target.

You can protect your overhead structures in the same efficient, low-cost way. Unskilled men install Armco Blast Plates easily and quickly, because they are easier to handle than heavy, bulky types. Fewer hangers are needed; and no stiffeners at all, thanks to the flanged design.

Armco Blast Plates provide this triple protection: (1) a substantial base plate of Armco Ingot Iron—the highly refined iron proved in more than 35 years of service; (2) a uniform zinc coating; (3) a thick special bituminous material, tightly bonded to the galvanized iron by Armco's Asbestos-Bonding process. Although ordinarily long-lasting, this special coating can be field-renewed if necessary, to provide extra years of economical service.

Try protective Armco Blast Plates on that next job. Meanwhile write us for prices and complete information. Armco Drainage Products Association, 5095 Curtis St., Middletown, Ohio.

ASBESTOS-BONDED ARMCO BLAST PLATES

New Aids to the Constructor

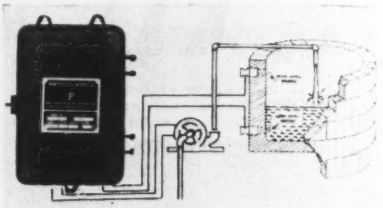
Equipment and material announcements and manufacturers' news

Two-Way Radio

A two-way radio used in the erection of the Kingsbury Ordnance plant, La-Porte, Ind. (*ENR*, Aug. 14, 1941, p. B.216) is the ordinary Motorola police set, battery powered, costing about $450 per station. That system operated on a Signal Corps frequency thus eliminating the necessity for Federal Communications Commission licensing. The Kingsbury layout is typical of that installed in thirteen other ordnance plants. The plant has 82 two-way radio sets, one central station in the Administration Building, and now has a 15-watt sender with a radius of 30 miles. All sets are kept tuned to one wave length; reception is by loudspeaker and transmission is through a standard telephone hand set. Every conversation is heard over all sets, but only one person can talk at a time. The caller reaches any station or person by speaking the number or name of the one desired. Manufacturer of two-way radio sets for ordnance plants has an A-1-a priority.—*Galvin Manufacturing Corp., Chicago, Ill.*

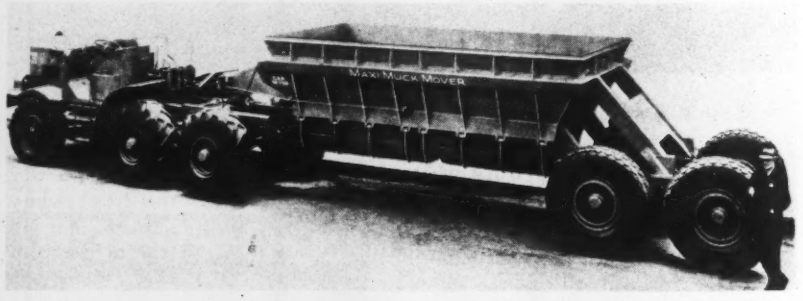
Footwear

A new type of footwear with patented non-slip sole to halt accidents has been especially designed for workers in the building industry, such as roofers and structural steel workmen. This sole is similar to that used on yachting shoes and is made of pure white rubber which leaves no mark on any surface. A line has now been introduced which includes a patrol rubber, a short boot, hip length boot, and special marine boot. Other types are expected to be developed. Industries faced with special requirements are asked to submit their problems.—*United States Rubber Co., Rockefeller Center, New York City.*



Electronic Level Control

A new "Photoswitch Level Control Series P16" provides on and off valve or pump control of liquid. Photoswitch probes or electrodes are attached to the tank at levels representing the low point where pumping starts, and the high level where pumping stops. These probes are wired to Photoswitch Level Control to automatically hold the level within prescribed limits. Ask for Pamphlet 1100.—*Photoswitch Incorporated, 21 Chestnut St., Cambridge, Mass.*



Tractor Trailer on Rubber Tires for Rapid Hauling

A large capacity 6-wheel tractor-trailer designed for heavy duty transport has a heaped capacity of 40 cu.yd. The unit consists of Tri-Pull 6-wheel tractor and Maxi-bottom-dump muck mover with two doors controlled individually or together by a two-drum winch, allowing material to be spread in windrows of varying size. Rear wheels of both tractor and trailer units have walking-beam assembly, allowing high rise of individual wheels to reduce shock on body and to assure smooth riding. Tractor is powered by 225 hp. motor, has fluid coupling which largely eliminates gear shifting, and final drive by sprocket and heavy duty chain to each wheel. The tractor may also be used to operate a 23 yd. carryall scraper. Tractor speeds range up to 22 mph. Maxi Muck Mover body measures 18 ft. by 9 ft. 4 in. at the top and has a height of 9 ft. 4 in. It weighs 22,500 lb. and has capacity of 80 tons.—*Six Wheels, Inc., 1572 E. 20th St., Los Angeles, Calif.*

STEEL FOR THE PENNSYLVANIA TURNPIKE

1430 tons fabricated by American Bridge Co. for tunnels and bridges

DUNNINGS CREEK BRIDGE— a continuous-type, skew, plate girder structure, 480 feet long, comprised of 48-ft. end spans and 4 intermediate spans, each of 96 ft. It carries a 4-lane, 56-ft. roadway with a 4-ft. division strip in center. Each half roadway is supported on 2 lines of curved bottom flange girders spaced 23 feet on centers. Cantilevered brackets at each side support 2-ft. sidewalks and pipe railing.

Built for the Pennsylvania Turnpike Commission. Gen. Contractors: M. Bennett & Sons; Engineers: Parsons, Klapp, Brinckerhoff & Douglas.

FAMOUS as America's longest, most modern and number one superhighway, the Pennsylvania Turnpike's 160 miles of easy-grade and direct alignment is a prophetic example of modern highway construction.

In its stride from Irwin, near Pittsburgh, eastward to Middlesex, near Harrisburg, it breaks down the formidable barriers of the Allegheny Mountains by tunneling the highest ridges and bridging streams and deep ravines.

American Bridge Company had an extensive part in the steel requirements of this outstanding project, supplying 1430 tons of fabricated steel entering into tunnel construction and permanent bridge structures.

Of the five bridges that are American Bridge-built, the plate girder structure over Dunnings Creek, in Bedford Township, is of special interest. Esthetically pleasing in its simplicity of treatment and efficient use of durable steel, the Dunnings Creek Bridge was singled out by the Jury of Award of the American Institute of Steel Construction as the most beautiful "Class B" (cost range between 250,000 and 1,000,000 dollars) steel bridge opened to traffic during 1940.

Thus again is exemplified American Bridge Company's continuing participation, of more than a half century's standing, in the growth and development of America's steel-framed network of travel and commerce.

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

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Our ships—guns—tanks—planes are being built with blueprints made from Arkwright Tracing Cloths. For Master Draftsmen in key defense plants know the importance of *permanent* transparency . . . quality of finish in the tracing cloth they use in planning vital defense production. These advantages are just as important in the swift, efficient, profitable manufacture of *your* product. Write today for free working samples of the four Arkwright brands of tracing cloth. You'll find one of them is exactly right for you! Arkwright Finishing Company, Providence, Rhode Island.

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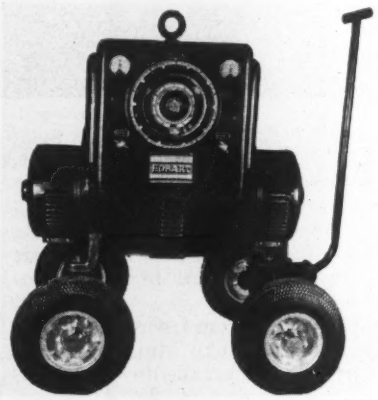
Wire Rope

Tournarope, a 6 x 19 filler wire right lay, lang lay wire rope with an independent wire rope center and an identifying galvanized core strand, manufactured by R. G. LeTourneau, Inc., especially for cable-operated tractor-drawn equipment, is now available. It's made of 199 fine steel wires, drawn to LeTourneau's own specifications, each wire bathed in oil as it goes into the strand die.

LeTourneau began the manufacture of Tournarope a year ago. Since then all LeTourneau equipment shipped from the factory has been equipped with this new, specially made wire rope. As a result, Tournarope has been thoroughly tested by hard usage on the country's biggest and toughest earthmoving jobs.

Made in 6 Sizes—Tournarope comes in the following sizes: 3/8", 1/2", 5/8", 3/4" and 7/8". It is easy to order—all you have to do is specify the size and number of feet wanted. No worrying about type or lay.—*LeTourneau-"Caterpillar" distributors.*



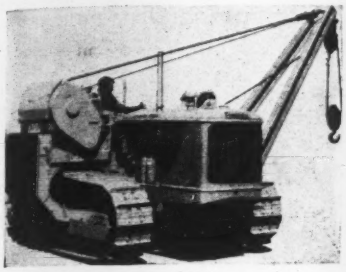
Welder Trailer

A new four-wheeled light-weight pneumatic-tired trailer for mounting Hobart electric drive welders has been announced. Easy portability makes this new welder doubly useful, enabling it to make hurry-up trips for emergency work. The trailer is designed so that mounting is easily accomplished by means of four bolts in the frame of the trailer and is easily moved by hand, operating on a 27-in. tread.—*Hobart Brothers Co., Troy, Ohio.*

Unit Substations

A new line of metal-inclosed, factory-built unit substations, compactly designed for power and lighting service, has been announced by G. E. The substations consist of one or more metal-clad switchgear units in the incoming-line section, a three-phase transformer section, and 1 to 15-metal-inclosed air circuit breakers on the low-voltage feeder

side. They can be installed indoors or outdoors to transform power from the 2300- to 15,000-volt range to 600 volts or below, and provide protection and control for the low-voltage feeders. Descriptive bulletin GEA-3592 gives complete details.—*General Electric Co., Schenectady, N. Y.*



Pipe-Layer

Trackson has announced a new Model MD Pipe-Layer, a tractor side-crane that mounts on the new Caterpillar D6 model and takes full advantage of the increased power, ease of control, and other improvements built into this tractor. The new pipe-layer has a lifting capacity ranging from 7,300 lb. at 12-ft. overhang, to 23,700 lb. at 4-ft. overhang, and is one of a complete line of Trackson pipe-layers available with lifting capacities up to 67,000 lb.—Ask for Bulletin 459.—*Trackson Co., Milwaukee, Wisc. or Caterpillar Dealers.*

Odor Adsorbers

A new unit type odor adsorber will rid 100 cu.ft. of air per min. of odors and gases. It is especially designed for homes, doctors' offices, etc., but is adaptable to uses in sewage plant offices, etc. The new unit, type A, comes in an attractive streamlined enamel metal case with chromium stand that can be used as portable or stationary model. It is 24 in. long, 10 in. high and 10 in. wide with a 40-watt motor, circulating fan, dust filters and four carbon-filled cannisters. Upkeep is nominal as the carbon, when saturated, can be reactivated and used again. Price of the unit is about $50.—*W. D. Connor Engineering Corp., New York, N. Y.*

Marine Paint

Skyco Marine Black is an all-purpose paint for the marine field. It is an ideal bottom paint and does a splendid job top side, in the hold, and on deck. It is said to be tough, elastic, and expands and contracts with the movement of the surface, and thus will not check, crack, peel or flake. This paint is also recommended for use on bridges, buildings, equipment, or any other surface exposed to water. Its bituminous base makes the paint in-

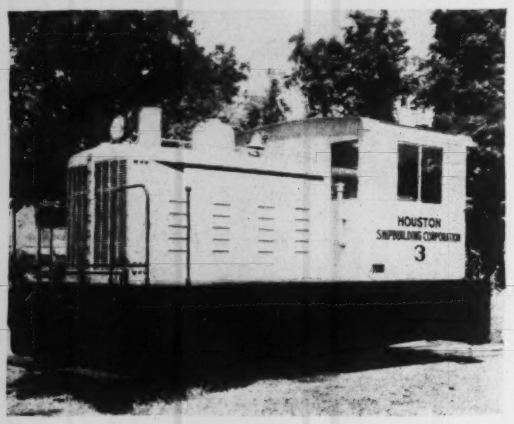
ARE YOU MEETING YOUR OBLIGATIONS

Every contractor today is doubly obligated to keep his equipment in first class operating condition . . . obligated to himself to do the job at a profit . . . obligated to his country to complete the job of National Defense in record time, without delays caused by power breakdowns. Your Cummins Dependable Diesels will stand a lot of neglect and *still* deliver low-cost, dependable power . . . but they will do the job—*still* cheaper, *still* better, *still* faster—if adequately maintained and serviced. Your Cummins dealer is eager to help you meet your obligations and he is equipped to do it with complete service facilities . . . *genuine* Cummins parts, expert mechanics, authoritative maintenance information. You'll find a Cummins dealer within easy reach of every job and *on the job day and night.* Cummins Engine Company, Columbus, Indiana.

BELOW: *Model HBI-600 Cummins Dependable Diesel, 150 hp. at 1800 rpm. Other models from 33 to 325 hp.*

AT BOTTOM: *Highways are vital to National Defense and this 2-yd. Cummins Diesel-powered Koehring shovel is doing a vital job on the Sunset Highway, east of Seattle, Washington.*

WHITCOMB LOCOMOTIVES'



DEPENDABLE
ECONOMICAL
POWER
MEETS
TODAY'S
UNUSUAL
DEMANDS
FULLY

Whitcomb locomotives are today playing their part in the production of urgently needed raw materials and manufactured products. Built to stand up under long hours of continuous service they are handling tough assignments with the greatest economy and least maintenance. Let us suggest the proper Whitcomb locomotive for your haulage problem.

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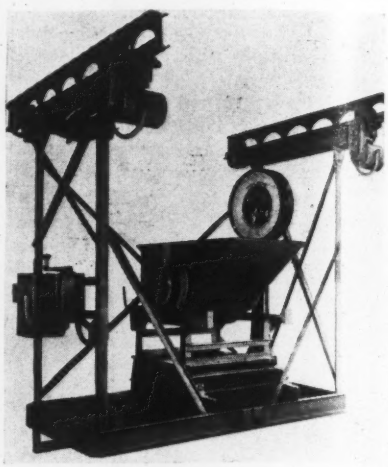
Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

definitely waterproof and abrasion-resistant, but it is not recommended for salt water.—*The Skybryte Co., Cleveland, Ohio.*

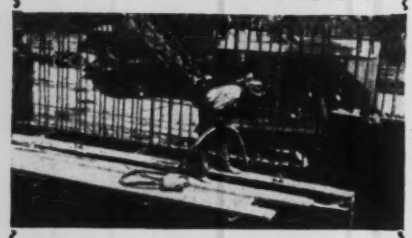


Batch Scale Car

The traveling batch scale car shown above is applicable for handling of batch materials for many processes. The car is motor-driven and controlled by an operator who rides on the platform space provided to the left of the bucket. A variable speed drum controller permits the car to be traveled at any speed up to 300 ft. per min. This unit makes it possible to gather the exact amounts from various bins that go to make up a batch, the scale on the car accurately weighing the ingredients as they are dumped in.—*The Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.*

VIBER COMPANY CONCRETE

VIBRATION



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. . . Viber will do the job fast and efficiently . . . prerequisites to profitable operation. This model is especially desirable for foundations, footings, concrete girders or beams, columns, floor slabs . . . thin sections in reinforced concrete bridges and grade separations, in diaphragm walls, columns, floor systems, hand rails, concrete piles at bridge site or in place . . . transition sections in hydraulic structures.

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2500 E. Cumberland St., Philadelphia, Pa.

There are three good reasons for sending work—your work—to ENTERPRISE. One is the high standard of quality to which ENTERPRISE galvanizing strictly adheres. Another is our large capacity — large enough for good service on defense work and your normal needs, alike. Third is the friendly, cooperative service we strive to give.

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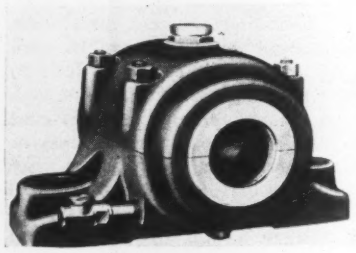
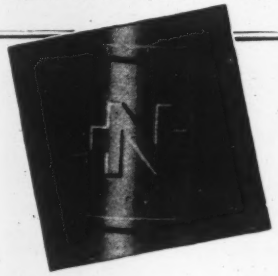


Pillow Blocks

The new Sleevoil Precision Pillow Blocks in plain and water-cooled types in shaft sizes from $1\frac{7}{16}$ in. to 8 in., inclusive, are available for a wide range of industrial applications where a high-grade babbitted bearing is required. Ample lubrication is provided by use of "T" section brass oiling rings. The bearings are fully self-aligning and can be furnished in either expansion or non-expansion types.—*Dodge Manufacturing Corp., Mishawaka, Ind.*

— *that's why contractors prefer these reinforcing bars!*

Order bars that bear the symbol of the Concrete Reinforcing Steel Institute. This symbol assures you quality bars, of domestic manufacture, rolled from new billet steel.



WHEN you specify U·S·S Concrete Reinforcing Bars you have *double* assurance of value. First, they are a U·S·S product—a name that stands for high quality in steel everywhere. Second, every new billet bar bears the Quality Symbol of the Concrete Reinforcing Steel Institute. This is your guarantee that it is full size, cleanly rolled from *new* billet steel to standard specifications, and of domestic manufacture.

And U·S·S service has long been a standard. Reliable distributors, equipped to meet your specifications as to cutting or bending, are located everywhere throughout the country. They can be counted on to do their utmost to fulfill your requirements.

For quality and a dependable source of supply, specify U·S·S on your next job.

U·S·S CONCRETE REINFORCING BARS

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CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
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United States Steel Export Company, New York

UNITED STATES STEEL

AMERICA'S LARGEST SINGLE-STORY INDUSTRIAL PLANT PROTECTED BY Carey BUILT-UP ROOFS

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General Contractors
Frank Messer & Sons, Inc. Cincinnati, Ohio
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Wright Aeronautical Corporation plant at Lockland, near Cincinnati, Ohio, covers 50 acres. Will turn out 1700 H. P. Cyclone Engines at rate of 1,000 a month; eventually will employ 12,000 workers.

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over all Industrial America

CAREY Roofs are in the forefront of industrial development today, as they have been for over a half century. Because of their dependable service and low upkeep, the popularity of these master specification roofs has grown steadily through the years.

Through constant research, CAREY Roofs have kept pace with building progress—have met every new test of service. Every CAREY Roof is engineered to withstand existing local conditions. Where extremes of temperature, salt air, chemical fumes, vibration, or other factors that affect roof life are present, the roof is designed to neutralize their destructive effects.

Whatever your roofing assignments may be, CAREY experience is a valuable asset that takes the gamble out of roofing results. Specify CAREY Built-Up Roofs for safety—economy. Write for book, "Master Specifications for Built-Up Roofs"—address Dept. 30.

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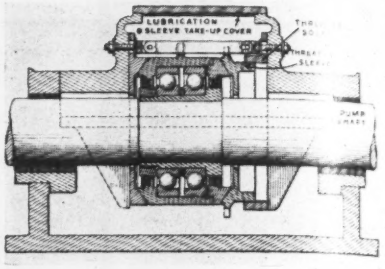
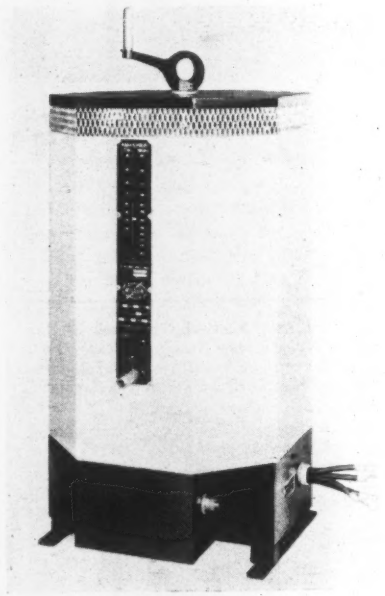
Dependable Products Since 1873
IN CANADA THE PHILIP CAREY COMPANY LTD. Office and Factory, LENNOXVILLE P. Q.



Pump Bearing

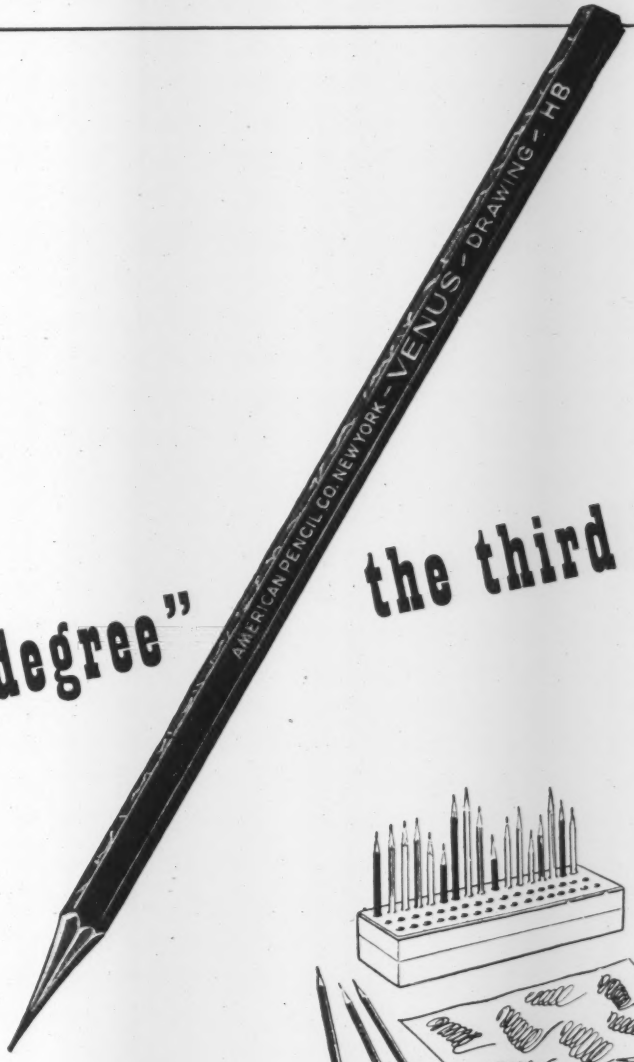
The unique bearing unit shown in the accompanying sketch was developed to simplify adjustment and alignment of the bearings in the larger size dredging pumps. The aligning feature is provided by the spherical surfaces on the outer cartridge faces and the adjustment is provided by means of the threaded sleeve and socket arrangement. The sleeve is readily accessible through an opening with a hinged cover and is turned to tighten or loosen it with a spanner wrench or screw driver.—*American Manganese Steel Div. of the American Brake Shoe & Foundry Co., Chicago Heights, Ill.*



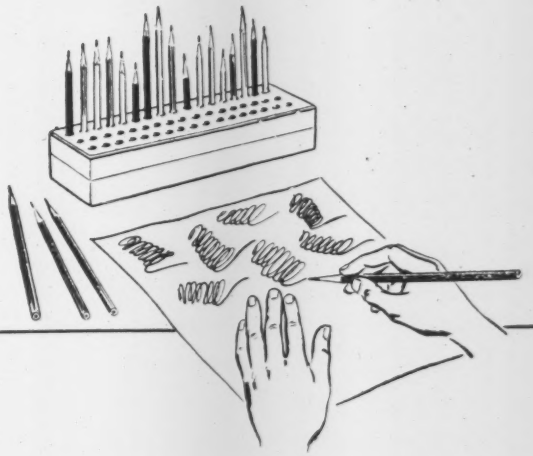
Transformer Arc Welders

A new line of a.c. transformer welders in 300, 500, 750 and 1,000-amp. capacities are completely self-contained units that will meet the heavy arc-welding needs of shipyards, railroads and heavy construction. They operate at 220, 440 or 500 volts, and 25- or 60-cycle current. The new welders have a wide range of current output and continuous stepless current regulation is provided over the entire range by means of a hand crank on top of the machine. Known as the

Why more ARCHITECTS and ENGINEERS buy Venus than any other 10¢ pencil



Giving "degree" the third degree



● You can bet your bottom dollar that a VENUS 2H will be exactly the same VENUS 2H, wherever and whenever you buy one. And so it is with all 17 degrees—invariably.

Why? Because there is an absolute VENUS standard of degrees. You can rely that every single batch of VENUS lead goes through a "third degree" gruelling. It must pass four "inquisitors", who have been testing VENUS leads through many years. That's why you can count on this absolute standard every time.

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17 Degrees—9H to 6B. 3 Degrees for Tracing and Direct Pencil Blueprints.

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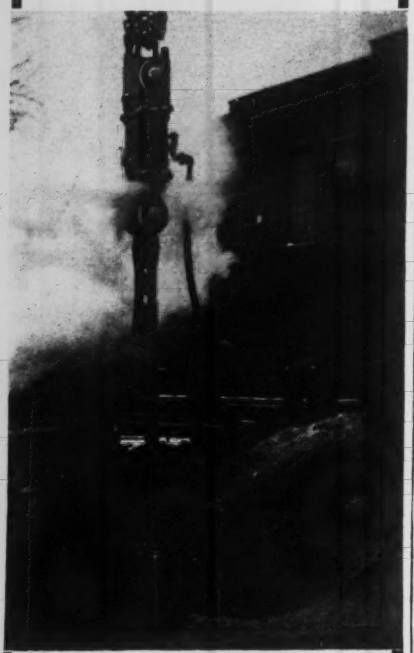
VULCAN
PILE EXTRACTORS

FOR PULLING SHEET STEEL, WOOD, CONCRETE, H-BEAM, AND PIPE PILES



Inexpensive . Compact

The Vulcan Pile Extractor is a compact and inexpensive machine expressly designed for pulling Sheet Steel, Wood, Concrete, H-Beam and Pipe Piles. Made in 3 types to meet all needs.

Since 1927, contractors have used it under favorable as well as adverse conditions in every part of the country and they report that the machine completely justifies all claims made for its efficiency, hardiness and rapidity of performance. Write for details.

VULCAN IRON WORKS Since 1852

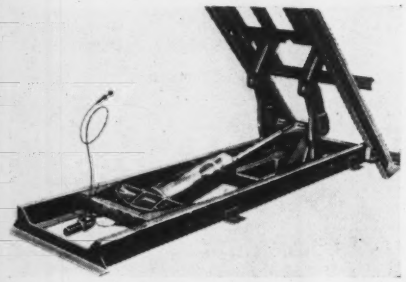
331 North Bell Avenue

Chicago Illinois

Model TW, these welders have an efficiency of approximately 80 to 85 percent. —*Wilson Welder & Metals Co., Inc., 60 East 42nd St., New York City.*

Pencil Tracing Cloth

Good, clear blueprints can be made from pencil tracings on Whitex, a new white tracing cloth, according to an announcement by Post. The material is tough, durable, and will not discolor with age. Its glossy "stay clean" back is an added feature and its extra transparency adds speed to print production. Whitex erases quickly and cleanly with art gum or a soft eraser, and erasures do not show on the blueprint. Samples of Whitex can be obtained.—*The Frederick Post Co., Box 803, Chicago, Ill.*



Truck Body Hoist

The Anthony Co. has announced that their complete line of hydraulic hoist dump bodies, in capacity from 5 to 30 tons, will be of the double-arm "super" hoist design. The patented hoist design permits exclusive use of "rubber restraining blocks which replace awkward old-fashioned restraining chains and springs. Other features of the device are telescopic tipping and subframe for lower mounting and greater load and truck stability. —*Anthony Co., Inc., Streator, Ill.*

Prevent Welding Spatter

For jobs where a weld is to be neat and free from spatter, an "Anti-Spatter" has been developed to allow easy removal of the usual spatter. The material may fly and settle thickly about the weld, yet when "Anti-Spatter" has first been applied all the spatter may be readily brushed off. A descriptive folder is available.—*Thompson & Co., P. O. Box 6757, Pittsburgh, Pa.*

Safety Posters

Dramatic, colorful safety posters, driving home to workers the value of safety precautions, will be mailed to concerns requesting such service.—*American Optical Co., Southbridge, Mass.*

Compact! Powerful! Safe!

DISTRIBUTABLE CONTROLLED POWER

with Beebe Bros. ALL STEEL HAND HOIST SEATTLE, U.S.A.

★

Money Has Been Saved on These Jobs!

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.

Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.

Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.

★

When raising, lowering, or placing costs by power are a serious problem, the answer is the right number of Beebe Bros. All Steel Hand Hoists MANNED IN UNISON. Available in 2, 5 and 15 Ton sizes. Sold through leading dealers in all trade centers. List of dealers sent upon request.

BEEBE BROS., 2720 6th Ave. S., Seattle, U.S.A.

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STERLING
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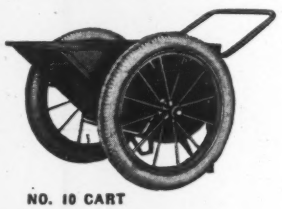
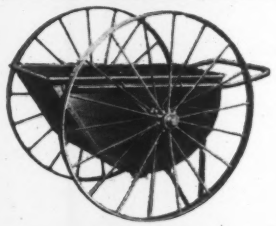


NO. 10 CART

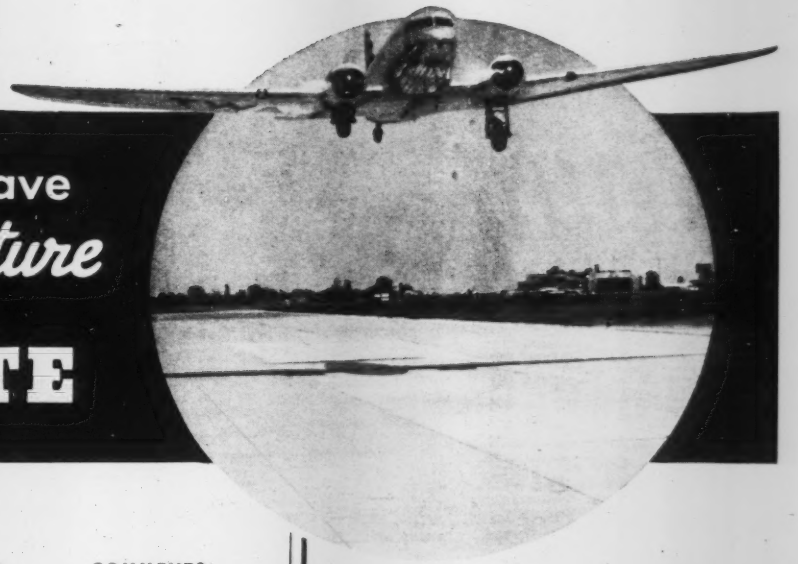
30"-36"-42" dia. flat or oval tire steel wheels.
30"-44" dia. pneumatic tire wheels.
Plain or Roller bearings.



NO. 6 CART

Sterling
WHEELBARROW CO.
MILWAUKEE, WISCONSIN

These airports have *paved for the future* WITH CONCRETE



AIRPORT AND CONCRETE YARDAGE	WHEN CONSTRUCTED	COMMENTS
Floyd Bennett Field—311,200 sq. yds.	1929-30 (2 runways and aprons) 1935-36-40 (additions)	Heavy traffic. Excellent condition. Maintenance cost negligible.
Rhode Island State Airport—220,000sq.yds.	1935-41	Very small expense for maintenance. Excellent condition. Includes 41,800 sq. yds. under contract.
Grand Central Air Terminal, Glendale, Cal.—39,000 sq. yds.	1928-29	Excellent condition. Little maintenance needed.
Lunken Field, Cincinnati Municipal Airport—140,000 sq. yds.	1932	After 9 years of traffic and a flood 20 ft. deep, pavement in excellent condition.
Wayne County Airport, Detroit—242,000 sq. yds.	1929-30—1940-41	Performance of 193,000 sq. yds. built in 1929-30 led to use of concrete for 49,000 sq. yds. extension in 1940-41.
Indianapolis Municipal Airport—145,000 sq. yds.	1930-36-37-40	Original concrete runways and aprons progressively extended—with the same type of pavement. More concrete planned.
Wold-Chamberlain Field, Mun. Airport of Minneapolis—415,000 sq. yds.	1935-36-40-41	174,000 sq. yds. in 1936. 241,000 built or under construction, 1939 to date. Additional 278,000 planned.
Toledo Municipal Airport—164,000 sq. yds.	1940-41	Rebuilt with concrete to replace a short-lived surface which originally cost about as much as concrete.
Hamilton Field, San Rafael, Cal.—338,000 sq. yds.	1934 (aprons) 1939 (runways)	Excellent performance of aprons built in 1934 dictated choice of concrete for new runways.
Barksdale Field, Shreveport, La.—292,000 sq. yds.	1932-1940	175,000 sq. yds. placed in 1932 has given good service—117,000 sq. yds. more in 1940.

Look at Concrete's Record at Typical Airports

Which type of pavement for airports has the best record for standing up under ever-increasing traffic?

Which has served the longest periods with lowest maintenance and least annual cost?

Which has provided greatest safety in all weather, greatest strength in emergencies?

Service records of leading airports say: CONCRETE! Records like these explain why 50 fields now have concrete runways; why concrete is the choice for over 15,000,000 sq. yds. of airport pavement, including that now being rushed to completion at civil and military airports.

Insure years of safe, economical, all-weather operations by specifying concrete for runways, aprons, turn-arounds and taxiways of main airports. Design and construction data on request.

PORTLAND CEMENT ASSOCIATION
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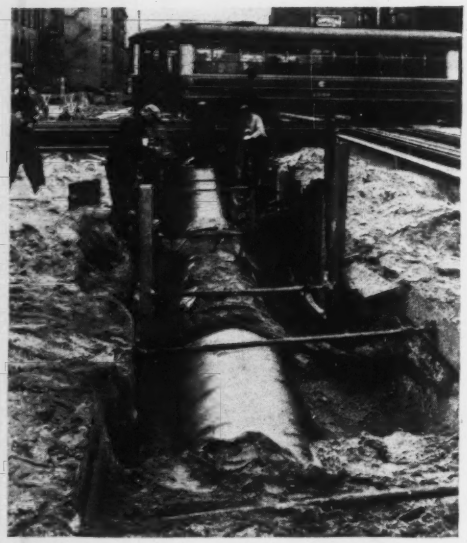
Reilly

Primer and Pipe Enamel



Courtesy Chicago Bridge and Iron Co., Fabricators of Steel Pipe

PROTECT NEW CHICAGO WATERLINES

In its construction of water mains and pipe lines, the City of Chicago builds for permanence with steel pipe protected by coatings of Reilly Primer and Pipe Enamel . . . These coatings bond firmly to the metal and are strongly resistant to abrasion. They withstand wide temperature variations without sagging in summer heat, or cracking in winter cold. When used on interior surfaces they effectively prevent tuberculation and assist in maintaining maximum flow over a long period of years. Complete information will be mailed on request.

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NEW PUBLICATIONS

National Defense — Marmon-Herrington in an elaborate and well-illustrated brochure shows the work and production of Marmon-Herrington on All-Wheel-Drive trucks, track-laying tractors, and tanks for defense. A chart shows Marmon-Herrington production curves have risen to nearly 600 per cent of 1939 production while total industrial production, according to *Business Week*, is about 140 per cent. The new publication features the fact that every pound of weight of every vehicle rests on a driving wheel and shows equipment and military machines in action.—*Marmon-Herrington Co., Inc., Indianapolis, Ind.*

Vibration Insulators—Goodrich has just published a new 12 page catalog section on its Vibro-Insulators, the devices of metal and rubber which have found wide acceptance in combatting the vibration and noise problem.—*The B. F. Goodrich Co., Akron, Ohio.*

Parking Meters—A mailing piece describes Apex parking meters which are designed to satisfy traffic officers with an easy to read signal and a hidden unexpired time feature. It can be set for two parking periods.—*General Engineering Co., 608 University Ave., Syracuse, N. Y.*

Nickel Alloys—"Individualized Inco Nickel Alloys" is the title of a twelve-page catalog giving individual characteristics, mechanical properties and application information on the Inco nickel alloys.—*The International Nickel Co. Inc., 67 Wall St., New York City.*

Jacks—Pocket Catalog No. 1066 contains complete factual data on all types and sizes of Buda jacks and includes a table that can be used to select the correct jack for any specific job.—*The Buda Co., Harvey, Ill.*

Defense Orders—Ryerson has available for distribution to executives a booklet "Blueprint of Defense Production," published by Conover-Mast Corp., which tells what to do, where to go and whom to contact when desiring an opportunity to bid on defense work. The booklet explains all necessary steps, including details of survey of the plants and equipment, methods of financing if more capital is needed, and the government cooperative plan in connection with production, priorities, purchasing and labor. New Ryerson literature is also available on cold finished steel bars and welding electrodes for welding stainless and mild steels.—*Joseph T. Ryerson & Sons, Inc., Box 8000-A, Chicago, Ill. or any branch.*

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents

Symbols and Abbreviations Include:

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply — Unclassified
Sewers, Waste Disposal — Latin America
Bridges, Grade Cross'gs — Public Buildings
Streets & Roads — Commercial Buildings
Earthwork, Waterways — Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR):

LOW BIDDERS: All low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

WATER SUPPLY

PROPOSED WORK

†Conn., Groton—Boro, WW addns., Docket Conn. 6-103. **$104,400. DPW.**

Ill., Eldorado—Eldorado Water Co., Eldorado, clear well, appurtenances. Over $15,000. K. B. Narans, Eldorado, supt. Water.

†Ill., Hanover—Village, WW addn., Docket Ill. 11-127. **$17,000. DPW.** CD 10/2—ENR 10/10.

Ill., St. Elmo—Reservoir. $25,000. Decatur Eng. Service Corp., Decatur, engrs. CD 9/3—ENR 9/11.

Ill., Sesser—Clear well, rehabilitating filter 2, in existing water purification plant. Over $15,000. F. E. Williams, West Frankfort, engr.

†Ind., Kingsbury — Town, water supply, distr. sys., Docket Ind. 12-115, $60,000. **DPW.**

Ind., Lagro—$60,000 bond election soon, water sys.

★**Mass., Lowell**—Supt. Water Dpt., water sys., pumping sta., wells and watermains. $525,000.

Mich., Rawsonville (Ypsilanti)—Ford Motor Co., Schaefer Rd., Dearborn, 12,815 ft. 24 in. watermain, connections, valves, specials in connection with supply for bomber plant. Hubbell, Roth & Clark, 2640 Buhl Bldg., Detroit, engrs.

Mo., Florissant—C. G. Peters, city clk., $15,000 bond election Oct. 4, WW exten.. CD 8/8—ENR 8/11.

Mont., Fairfield—Water sys. $65,000. Bond issue approved. T. G. Raitt, town clk.

★**†N. H., Portsmouth**—City, water supply and disposition sys., Docket N. H. 27-104, $857,000. **DPW.**

†N. J., Bellmawr—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., excavating, constructing ci. watermains, etc. streets, defense housing. $35,000. WPA. G. R. Swinton, 930 Atlantic Ave., Atlantic City, owners and WPA engr.

N. J., Newark—Water Dpt., City Hall Annex, watermains. $32,500. WPA. W. Banks, City Hall Annex, WPA and city engr.

N. Y., Jamestown—Bd. Pub. Utilities, City Hall, T. V. McKee, secy., replacing c.i. watermains E. 2' St., also changing ornamental lighting sys. $15,000. C. O. Johnson, supt.

★**N. C., Fayetteville**—J. S. McFayden, mayor, WW exten., $196,000; filter plant, $589,000. Applied for DPW funds.

★**N. C., Wilmington**—J. G. Wallace, city mgr., WW plant. $2,820,014. Applied for DPW funds.

O., Woodville—H. A. Karchner, mayor, $26,000 bond election, Nov. 4, imprv. exten. WW.

Okla., Nowata—Preliminary plans watermain exten. $23,000. WPA. A. Walker, Nowata, engr.

†Ore., Hermiston — City, bids in October, enlarging, imprv. water sys., Docket Ore. 35-116, $96,134. DPW. R. H. Corey, Bedell Bldg., Portland, engr. CD 9/9.

S. D., Huron—Preliminary survey water sys. imprvs. $20,000. E. H. Dunmire, 2274 South St., Lincoln, Neb., engr.

Tex., Burkburnett—C. J. Brannon, mayor, WW and sewer imprvs., storage reservoir, Tex. 41-324. $51,355. Applied for DPW funds. J. E. Ward, Harvey-Snider Bldg., Wichita Falls, engr.

Tex., Hawkins—C. W. Cumbie, mayor, WW. sys. $70,000. Albert C. Moore & Co., 2404 Smith-Young Tower, San Antonio, engrs. CD 3/7—ENR 3/13.

Tex., Midland—M. C. Ulmer, mayor, WW imprvs., Tex. 41-309. $35,000. Applied for DPW funds. L. A. Hodenhizer, Midland, engr.

†Tex., Mineral Wells—City, WW facilities, Docket Tex. 41-155. $237,000. **DPW.** CD 8/4—ENR 8/7.

Tex., Odessa—R. D. Waddell, mayor, City Hall, water exten., appurtenances. $289,000. Applied for DPW funds. O. G. Lee, City Hall, engr.

†Tex., Weatherford—City, WW and sewerage sys. facilities, Docket Tex. 41-184. $58,700. **DPW.** CD 8/6—ENR 8/14.

Wash., Buckley—State Dpt. Finance, Olympia 2,200 ft. 8- to 10-in. transite and 7,200 ft. 8- to 10-in. steel water supply line, chlorinating plant, etc. $104,821. Seeking WPA funds.

Wash., Everett—Pinehurst Water Dist., Everett, rehabilitation water distr. sys., installing fire protection sys., hydrants. $110,000. Seeking PWA funds. Parker & Hill, Smith Tower, Seattle, engrs. CD 8/6—ENR 8/14.

Wash., Seattle—Water Dist. 1, c/o Parker & Hill, engrs., Smith Tower, bids soon. 2,000 ft. 6 in. pipeline across Yarrow Bay and 2,000 ft. 6 in. pipe for shore approach at Yarrow, near here.

Wash., Vancouver—Clark Co. Pub. Utility Dist., water sys. to serve Lincoln Heights and Brynlawn Dist. $40,000. J. L. Henderson, City Hall, engr.

BIDS ASKED

Bids Asked October 1

†Md., Hyattsville—Washington Suburban Sanitary Comn., Owens Ave., c.i. watermains, Contr. 138-W. H. R. Hall, ch. engr.; adv. ENR 9/25.

Wash., Tacoma—City, furnishing 9,910 ft. 58 in. inside diam. coal tar enameled steel pipe or furnishing and installing equal length lock joint concrete pipe, fittings, structures, watermain Park Ave. between S. 64 and 94 Sts. $230,000. A. W. Kunigk, City Hall, water supt.

Bids Asked October 13

Calif., Los Angeles—Dpt. Water & Power, 207 S. Bway., water tunnels for harbor steam plant, 2 lines 96 in. I.D. rein.-con. pipe, and concrete mat, Wilmington. Over $25,000. H. C. Gardette, 207 S. Bway., engr.

LOW BIDDERS

Calif., Los Angeles—Purch. Agt. Dpt. Water & Power, 207 S. Bway., Sept. 16, concrete water reservoir, Mt. Washington, Spec. 3867, from R. A. Grut, 318 W. 9 St. **$17,600.** CD 9/4.

†S. C., Moultrieville—Con. Q.M., Sept. 16, elevated steel water tank, from Darby Corp., 1 and Walker Sts., Kansas City, Kan., **$24,684.** CD 9/8—ENR 9/11.

CONTRACTS AWARDED

†Ala., Dothan—U. S. Eng., Federal Bldg., Mobile, water tank, Advanced Flying School, to R. D. Cole Mfg. Co., Newnan, Ga. **$49,870.**

†Ariz., Phoenix—Federal Work Agency, 7 and D Sts. S.W., Wash., D. C., water and gas utilities defense housing, Luke Field, to Tiffany Constr. Co., W. Broadway Rd., **$19,314.** Awarded 9/13.

Conn., Waterbury—C. A. Root, city engr., high pressure control plant, pump. and chlorinating facilities, 3 water turbine pumps, etc. to Turbine Equipment Co., 75 West St., New York, N. Y., **$96,887.** Bids 9/16. M. Pirnie, 25 W. 43 St., New York, engr. CD 9/3—ENR 9/11.

Minn., Spring Grove—Watermains, storm and sanitary sewers, **WPA.** Over **$50,000.**

★**N. Y., New York**—Comr. Water Supply, Gas & Electricity, Municipal Bldg., furnishing, delivering, laying steel, c.i. watermains, Cooper, Metropolitan and 82 Aves., Kessell, 69 and 132 Sts., Yellowstone Blvd., Union Turnpike, Utopia Parkway, Park and Park Lane, Queens Boro, to Carmine Petracca, 59 Taaffe Pl., Brooklyn. **$516,272.** Bids 7/15. CD 7/17—ENR 7/24, under LB.

O., Waynesfield—Bd. Trustees Public Affairs, E. Jorg, clk., water distr. sys., to J. C. O'Brien, 214 W. Grand St., Lima, **$23,783.** Est. $25,000. Bids 8/29. CD 8/21.

†Tex., Camp Bowie—Con. Q.M., concrete, steel water storage reservoir, to Claude Everett, Inc., 522 Barziza St., Houston, approx. **$52,000.**

†Tex., Waco—U. S. Eng., Santa Fe Ry. Bldg., Galveston, 300,000 gal. steel elevated tank and tower, to Chicago Bridge & Iron Co., Box 2567, Houston, **$51,265.** CD 9/8—END 9/11.

Alta., Calgary—Dpt. National Defense for Air, water and sewerage sys., Elementary Flying Training School, to Bennett & White Constr. Co., Ltd., 302 Examiner Bldg. **$39,000.**

Ont., Welland—Bd. Water Comrs., brick, rein.-con. filtration plant, addn., to Gardner Constr. Co., 7 River Bank St. **$40,000.** Bids 8/9, awarded 9/18. CD 8/4.

Que., Beloeil—Aqueduct, etc. from Mountain St. to Jackson Reservoir, to Southern Working Ltd., 4895 Cartier St., Montreal, about **$51,000.** CD 9/17.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Ark., Hope—A. Groves, mayor, exten. sewer lines, enlarging sewage treatment plant. $150,000. Applied for Federal funds.

†Calif., Fairfield—Solano Co., sewage pump. plant addn., Docket Calif. 4-162. $17,900. **DPW.** CD 7/28—ENR 7/31.

†Calif., San Luis Obispo—City, sewage treatment plant, imprv. and addns., Docket Calif. 4-144, $128,730. **DPW.** CD 7/28—ENR 7/31.

†Calif., Victorville—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., sewage disposal plant, airport. Over $25,000. Koebig & Koebig, 821 Rowan Bldg., Los Angeles, engrs.

Conn., New Britain—P. Wks. Dpt., sewer and water utilities, for housing. Over $25,000. G. Molleur, City Hall, engr.

Ga., Decatur—Comr. Roads and Revenues, De Kalb Co., Decatur, sewerage sys., $137,000; Druid Hills Garbage incinerator, $100,000. Robert & Co., Bona Allen Bldg., Atlanta, engrs.

Ill., Galesburg — Galesburg Sanitary Dist., secondary digest with gas collection. Over $25,000. Alvord, Burdick & Howson, 20 N. Wacker Dr., Chicago, engr.

†Ill., Wilmington — City, sewer extens., Docket Ill. 11-145, $15,946. **DPW.**

†Ind., Fort Benjamin Harrison—Con. Q.M., incinerator. $30,000 or more, incl. equip.

Kan., Kansas City—Sub-sewerage sys. between Allis and Hallock Sts. north of Quindaro St. $50,000. Truman Schlup, city engr.

†La., Leesville — Mayor and Bd. Aldermen, postponed indefinitely bids to have been opened Sept. 16, sewerage sys. and sewage treatment plant, Docket La. 166-101. **DPW.** CD 9/4.

Md., Towson—Comrs. Baltimore Co., Court House, sewers, appurtenances, 2 pump. sta., etc.

†Miss., Hattiesburg — City, sewerage sys. extens., Docket Miss. 22-118. $15,400. **DPW.**

N. J., Newark—Sheating, sewers, $71,000. WPA. J. Costello, City Hall, WPA and city engr.

N. J., Newark—12- to 24-in. rein.-con. sewer lines, inlets, etc., Newark Airport. $74,729. WPA. A. Armstrong, Admin. Bldg., Newark Airport, owner's and WPA engr.

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TAPES · RULES · PRECISION TOOLS

SEWERS, etc. (Proposed Work, Cont'd.)

N. J., Stirling—Passaic Twp., Twp. Hall, sheating, sanitary sewers. $70,000. WPA. C. Malstrom, Orange and N. 6 Sts., Newark, WPA and owner's engr.

N. Y., Salamanca—T. Wilson, mayor, outfall sewer from E. State and new streets south to Allegheny River. $30,000.

★**N. C., Fayetteville**—J. S. McFayden, mayor, sewer exten. $$473,000; sewage disposal plant. $845,000. Applied for DPW funds.

N. C., Wilmington—J. G. Wallace, city mgr., sanitation and sewers. 205,879. Applied for DPW funds.

★**O., Akron**—$800,000 bond election Nov. 4, sewer exten. and imprv. sewage disposal plant.

O., Lima—$152,000 bond election Nov. 4, incinerator plant. H. P. Jones & Co., 2nd Natl. Bank Bldg., Toledo, engr. CD 6/13/40—ENR 6/20/40.

†**Ore., Hermiston** — City, bids in October, sewage treatment plant and sys. $109,680. **DPW.** R. H. Corey, Bedell Bldg., Portland, engr.

Pa., Meadville — Voted bonds incinerating plant. $75,000. R. L. Phillips, city engr. CD 5/12—ENR 5/15.

Tex., Bastrop—W. Rogers, mayor, complete sanitary sewerage sys., disposal plant. $175,000. Applied for DPW funds. L. Southerland, c/o Nalle Bldg., Austin, archt. Garrett Eng. Co., 4504 Audubon St., Houston, engrs.

Tex., Baytown—Tri-City Fresh Water Dist. 2, c/o H. Eilers, pres., Baytown, sewerage sys., disposal plant, activated sludge sewage plant with outfall to Goose Creek tidal stream, Tex. 41-287. $60,000. Applied for DPW funds. Ajax Eng. Co., 603 8 Ave., engrs.

Tex., Beaumont — R. Edmonds, city mgr., sewerage sys. imprvs. exten., Tex. 41-323. $111,968. Applied for DPW funds. J. C. Reid, Beaumont, engr.

Tex., Coleman—E. P. Scarborough, mayor, sewage disposal plant imprvs., etc., Tex. 41-291. $25,000. Applied for DPW funds. F. W. Chappell, 309 Burt Bldg., Dallas, engr.

Tex., Midland—M. C. Ulmer, mayor, sewerage sys. imprvs., sewer gathering lines, disposal plant addn., Tex. 41-310. $89,000. Applied for DPW funds. L. A. Rodenhizer, Midland, engr.

†**Tex., Wichita Falls**—City, sanitary sewer facilities, Docket Tex. 41-121. $24,850. **DPW.** CD 8/25—ENR 8/28.

†**Va., Radford**—City, sewerage sys. addns., Docket Va. 44-148. $231,100. **DPW.**

Wash., Bremerton—Kitsap Co., Court House, Port Orchard, sewers in Navy Yard City district, near here. $150,000. J. H. Pattison, Court House, Port Orchard, engr.

Ont., St. Catharines—Grantham Twp. Council, K. V. Brown, clk., 148 King St., sewers, Orchard Park subdivision, Grantham Twp. $75,000. D. G. Ure, Twp. Offices, St. Catharines, engr.

Ont., Sarnia—M. D. Stewart, municipality clk., incinerator. $30,000. A. Smith, City Hall, engr.

BIDS ASKED

Bids Asked September 30

Ont., Toronto—Chn. Bd. Control, sewers, W. Don Rd., southwest from Eastern Ave. to Gerrard St. $55,200.

Bids Asked October 1

†**Md., Hyattsville**—Washington Suburban Sanitary Comn., Owens Ave., vitr. sewers, Contr. 139-S. H. R. Hall, ch. engr.; adv. 9/25.

Bids Asked October 8

Calif., Los Angeles—Vitr. clay sanitary sewers Carmelina Ave. and Shady Dr. Sewer Dist. $40,000. L. Aldrich, City Hall, engr.

Bids Asked October 15

Calif., Los Angeles—22,500 6- and 8-in. sanitary sewers Mammoth Ave. $34,522. L. Aldrich, City Hall, engr. CD 7/28—ENR 7/31.

Bids Asked

Wis., Hales Corners — Sewage treatment plant. $100,000. Mead, Ward & Hunt, 550 State St., Madison, engr.

LOW BIDDERS

Calif., Oakland—City Council, Sept. 16, sewers Moraga Ave., from Oakland Sewer Constr. Co., Box 178, Walnut Creek, **$26,292.** CD 9/3—ENR 6/5.

Wis., Sheboygan—Sludge drying and incinerator equip., from Nichols Eng. & Research Corp., 60 Wall Tower, New York City. **$64,930.** A. L. Boley, city engr.

CONTRACTS AWARDED

†**Ariz., Phoenix** — Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., sewer facilities, paving streets, defense housing, Luke Field to Arizona Sand & Rock Co., S. 7 St. and River Bank, **$29,227.** Awarded 9/13.

†**N. J., Fort Hancock (Highlands)** — War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., storm-drains, sewerage sys., **WPA. $60,000.** CD 9/10—ENR 9/18.

O., Mentor—R. G. Clapp, mayor, sewerage sys., disposal plant. **WPA. $294,000.** CD 3/17—ENR 3/20.

Pa., McKees Rocks—C. Lanz, city secy., Municipal Bldg., pump station, st[illegible] and sewer repairs, etc., **WPA. $94,000.** Chas. Engineers, 210 E. Park Way, N.S., Pittsburgh, engrs.

Tenn., Chattanooga—Red Bank Utility Dist., sewerage sys. and disposal plant, Red Bank Bank and White Oak, **WPA, $363,9[illegible]** CD 8/12—ENR 8/14.

Tex., Beeville—E. Quinn, mayor, existing sanitary collecting lines and disposal plant imprvs., **WPA. $54,146.** J. S. Fenn[illegible] 115 Castillo Ave., San Antonio, engr.

Que., Montreal—Sewer St. Denis St., to Carlo Perluzzi Constr. Co. Ltd., 9300 La[illegible]ve St., **$28,200.**

Que., St. Johns—Dpt. National Defense for Air, Ottawa, Ont., sewerage and water distr. plant, No. 9 Repair Depot, to Marien Wilson, Ltd., 1434 St. Catherine St. W., Montreal, **$32,000.**

Que., Valleyfield—Wartime Housing, Ltd., 66 York St., Toronto, Ont., sewers, watermains, to H. F. McLean Ltd., c/o Dominion Constr. Co. Ltd., 1440 St. Catherine St. W., Montreal. Approx. **$50,000.**

Sask., Dundurn—Dpt. National Defense for Air, Ottawa, Ont., sewage disposal plant, aerodrome, to C. M. Miners Constr. Co. Ltd., Saskatoon. **$31,000.**

BRIDGES, GRADE CROSSINGS

PROPOSED WORK

Kentucky—Dpt. Hys., Frankfort, rejected bids Sept. 5, removing steel spans from bridge over Rolling Fork of Salt River, Bardstown-Elizabeth Rd. and re-erecting on Columbia-Knifely Rd., Adair Co. CD 9/10—ENR 9/18 under LB.

Missouri—State Hy. Comn., Jefferson City, two 8 ft. rein.-con. slab span, culvert type bridge over Old Stream, Route SB, Sec. FAS 400 B, two 12 ft. rein.-con. slab span culvert type bridge over Logan Creek, SB Proj. FAS 400 B1, both foregoing on Oxley-Naylor Rd., Ripley Co.; five 25 ft. continuous concrete slab span bridge over Old Channel Island Creek, Route 169, Sect. 13 B, Stanberry-King City Rd., Gentry Co.; one 50 ft. and two 25 ft., rein.-con. deck girder spans, bridge over Brushy Creek, Route 6, Sec. 17 F, one 40 ft., two 20 ft. I-beam span bridge over Old Channel Muddy Creek, Route 6, Sec. 17 F, both foregoing on Gallatin-Jamesport Rd., Daviess Co. C. W. Brown, Jefferson City, engr.

Missouri—State Hy. Comn., Jefferson City, rejected bids Sept. 5, two 10 ft. rein.-con slab span bridge over Creek, Sta. 646 plus 44, Ripley Co.; four 31 ft., and one 49 ft. I-beam span bridge over north fork South Fabius River, Adair Co. C. W. Brown, c/o owner, engr. CD 9/10 under LB—ENR 8/28.

O., Ravenna—Comrs. Portage Co., 75 ft. bridge over Cuyhoga River, Mennonite Church-Mantua Rd. $50,000. P. C. Shafer, co. engr.

Oklahoma—State Hy. Dpt., Oklahoma City, overpass over Rock Island Lines on U. S. 270, Holdenville, Hughes Co. $50,000. V. T. Moon, Capitol, Oklahoma City, engr.

Ont., Dryden—Province of Ontario, Toronto, concrete bridge over Wabigoon River. $35,000. Dpt. Hys., Toronto, engrs.

Ont., Weston—Pine Point Club Ltd., Weston, concrete bridge replacement. $30,000.

Que., Rouyn—Province of Quebec, Quebec City, new bids soon rein.-con. bridge over Lake Lemoine Narrows, Abitibi Co. $350,000. Bids June 10, cancelled. O. Desjardins, Dpt. P. Wks., Quebec City, ch. engr. CD 5/23—ENR 5/29.

BIDS ASKED

Bids Asked September 30

Ill., Galesburg—Knox Co., 3 span continuous steel I-beam bridge, Sect. 45 B-MFT. G. H. Baker, Centennial Bldg., Springfield, state engr. co. roads and city streets.

Bids Asked October 7

Indiana—State Hy. Comn., J. D. Adams, chn., Indianapolis, 36 ft. rein.-con. girder bridge over Spring Branch, State Rd. 36, Madison Co.; 60 ft. rein.-con. arch bridge over Dog Creek, State Rd. 64, Crawford Co.; 5 span 320 ft. rein.-con. arch bridge over Fall Creek, S. R. 534, Marion Co.; 48 ft. steel truss bridge, over West Fork Fish Creek, Owen Co.; 35 ft. steel beam span bridge, Wabash Ry. subway, State Rd. 51, Lake Co.; 50 ft. rein.-con. girder bridge over Hazel Creek, 0.4 mi. approach grading, bituminous stabilized surfacing State Rd. 47, Montgomery Co.; 36 ft. rein.-con. girder bridge over Bice Ditch, State Rd. 16, and 36 ft. rein.-con. girder bridge over Keefe Ditch, State Rd. 16, Jasper Co., 3 span, 69 ft. continuous rein.-con. slab bridge over Pigeon Roost Creek, 3 span, 108 ft., rein.-con. girder bridge over Kimberlin Creek, both State Rd. 356, Scott Co.; 40 ft. rein.-con. bridge over Elliott Ditch, 28 ft. rein.-con. girder span bridge over Wilson Ditch, both State Rd. 52, Tippecanoe Co.; 3 span 108 ft. rein.-con. girder bridge over Big Honey Creek, 1 span, 50 ft.

BRIDGES, etc. (Bids Asked, Cont'd.)

rein.-con. arch bridge over Old Erie Canal, both State Rd. 40, Vigo Co.; 28 ft. rein.-con. girder (exten.) over Kelly Prong Ditch, one 28 ft. rein.-con. girder (exten.) over Carter Ditch, 3 span, 69 ft., continuous rein.-con. slab bridge over Cypress Creek, one span, 28 ft. rein.-con. girder (exten.) over Cypress Creek overflow, all State Rd. 62, Warrick Co.; 3 span, 69 ft., continuous rein.-con. slab bridge over Green Creek, 1 span, 28 ft. rein.-con. girder over Green Creek Branch, State Rd. 36, Randolph Co.; 35 ft. rein.-con. arch bridge over West River, and 50 ft. rein.-con. arch span bridge over Martindale Creek, both State Rd. 36, Randolph Co. M. R. Keefe, c/o owner, engr.

Bids Asked October 8

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, through steel truss bridge over Arroyo de La Laguna, 3.2 mi. north of Sunol, Alameda Co.

Bids Asked October 9

D. C., Washington—Dist. Comrs., Wash., D. C., bridge over Tidal Basin, 14 St. S.W.

Florida—State Road Dpt., Tallahassee, J. H. Dowling, hy. engr., eleven 18 ft. timber-concrete composite-deck span bridge over Big Swamp Creek, Rd. 40, S.P. 5636 (1), Walton Co.

†**Mississippi**—Pub. Roads Admin., 305 Medical Arts Bldg., Florence, 0.047 mi. rein.-con. bridge Project 3L5, Natchez Trace Parkway, Attala Co.; adv. ENR 9/25.

Bids Asked October 10

Kentucky—Dpt. Hys., Frankfort, concrete, steel bridge over Kentucky River, Carrollton-Louisville Rd., Carrollton, Carroll Co.; steel superstructure bridge over Kentucky River, Lexington-Richmond Rd., Fayette Co.; dismantling 2 steel spans over Rolling Fork Salt River, Bardstown-Elizabethtown Rd., and re-erecting at Green River, Knifley Rd., Adair Co.; widening concrete bridge over South Fork Beaver Creek, Glasgow-Burkesville Rd., at Glasgow, Barren Co.; concrete bridge, Neon-Hamphill Rd., Yonts Fork, Letcher Co.

LOW BIDDERS

New Hampshire—State Hy. Dpt., Concord, Sept. 18, 140 ft. thru steel truss bridge, approaches, Errol Coos Co., from Thibodeau Constr. Co., Wolfsboro, **$51,276.** Est. $50,000. CD 9/5—ENR 9/11.

North Carolina—State Hy. and P. Wks. Comn., Raleigh, Sept. 18, structures 11.87 mi. P.6242, Burk and Catawba Counties, from J. H. Brinkley, Thomasville, **$73,382.** Est. $75,000-$100,000. CD 9/9—ENR 9/11, under Roads.

O., Cleveland—Frank Foy, acting city purch. agt., 120 ft. pedestrian tunnel, Sebert Ave., from Donnelly & Gallagher, 1231 E. 84 St., **$28,993.** CD 8/10.

CONTRACTS AWARDED

Mass., Salem—Commonwealth of Mass., Dpt. P. Wks., Boston, concrete rigid frame bridge over Boston & Maine R.R., Bridge St., to V. Barletta Co., 8 Whipple Ave., Roslindale, **$446,125.** Bids 8/12, awarded 9/17. CD 7/28—ENR 7/31.

Tex., Houston—Harris County, c/o Judge, concrete bridge, Steubner-Airline Rd., to H. E. Cagle, 2410 McDuffie St., **$40,166.** Bids about 8/29. H. W. H. Zapp, c/o Courthouse, co. engr. CD 8/15.

Que., St. Bruno de Guignes—J. P. Verina, municipality clk., bridge over La Loutre River, to J. Houle, Notre Dame St., St. Victor de Beauce. Est. **$25,000.** O. Desjardines, Dpt. P. Wks., Quebec, engr. CD 7/31.

STREETS AND ROADS

BIDS ASKED

Bids Asked September 29

N. J., Rockaway—Boro. Boro Hall, bituminous concrete on macadam surfacing 5,346 sq. yd. Franklin Ave. A. J. Proskie, Boro Hall, engr.

N. Y., New York—President Bronx Boro, Bronx County Bldg., 851 Grand Concourse, brick repaving E. 151 St.

N. Y., New York—Comr. Parks, office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., Contr. HRP 41-2, widening Hutchinson River Parkway exten. easterly to Westchester Co. line, Bronx Boro.

Bids Asked September 30

†**Ill., Havana**—Mason Co., grading, gravel or crushed stone surfacing, culverts, etc. 2.5189 mi. Sect. 12-MFT. G. H. Baker, Centennial Bldg., Springfield, state engr. co. roads and city streets.

N. J., Hamburg—Sussex Co., Court House, Newton, bituminous penetration macadam on gravel surfacing 3,858 sq. yd. Linwood Ave. and Oak St., Sect. 1-2-3. Bids 9/2 rejected. H. Snook, Court House, Newton, engr. CD 8/29.

N. Y., New York — President Manhattan Boro, Municipal Bldg., sheet asphalt paving transverse road 4; grading, curbing, flagging, constructing mails, sheet asphalt paving East River Imprvt. E. 14 to E. 18 Sts., Contr. 5-A.

★**Ohio**—State Hy. Dpt., Columbus, bituminous pre-mixed surface course on 4.169 mi. Sects. Rock Creek and N of SH 753, Ashtabula Co., $32,200; grading, draining, structures, widening, waterbound macadam paving 4.658 mi. Sects. E., F. and G. of SH 295, Fulton Co., 104,550; roadside imprv. 6.363 mi. Sects. G-1 and I of SH 1, U. S. 40, Licking and Muskingum Counties, $40,800; grading, draining, concrete and bituminous surface treating, building continuous concrete slab bridges over Little Twin Creek and Dry Run on Sects. Germantown and A of SH 65, Montgomery Co., $100,150; widening, asphaltic concrete resurfacing 1.041 mi. sections West Alexandria, F and E of SH 28, U. S. 35, Preble Co., $20,000; grading, draining, rein.-con. paving, building continuous steel beam bridge, concrete deck and substructure over Muddy Creek, Sects. L and K of SH 275, U. S. 20, Sandusky Co., $94,250; grading, traffic compacted surface course paving, concrete beam bridge over Little Racoon Creek, Sect. A of SH 800, Vinton Co., $9,850; widening, asphaltic concrete resurfacing 3.652 mi. Sects. J-1 and J-2, of SH 391, U. S. 21, Washington Co., $58,950; grading draining, concrete paving 0.552 mi. Sects. Franklin and I of SH 251, Warren Co., $50,350; grading, draining, concrete paving, continuous steel beam bridge, concrete deck and substructure on Sects. Montpelier and A of SF 581, U. S. 20 Alt., Williams Co., $54,650.

Bids Asked October 3

Alabama—State Hy. Dpt., Montgomery, C. J. Sherlock, djr., grading, drainage, surface treating, bridges, etc., 16.582 mi. Centerville-Mapleville Rd., FAP 266 A and S 394, Bibb and Chilton Counties; 1.485 mi. Prattville-Maplesville Rd., FAP 252 C(1), Autauga Co.; 8.54 mi. Linden-Thomasville Rd., FAP 21 A(5), Marengo Co.

Arizona—State Hy. Comn., Phoenix, grading, draining, aggregate base course, relaying oil mix, 6¾ mi. Ash Fork-Flagstaff Hy., SN-FA 89-D(7), Coconino Co. Over $100,000. W. R. Hutchins, Phoenix, engr.

Ia., LeMars — Bd. Supervs. Plymouth Co., gravel surfacing. Over $25,000. E. E. Nelson, LeMars, engr.

★**Pennsylvania**—State Hy. Dpt., at office L. L. Hughes, secy., Harrisburg, bituminous on native stone type B or crushed aggregate surfacing 13,729 ft. Legislative Route 63059, Sect. 1, Scott Twp., Wayne Co.; bituminous on type A or crushed aggregate surfacing, rein.-con. deck I-beam bridge, 10,370 ft. Legislative Route 62094, South Strabane, Chartiers Twps., Washington Co.; bituminous on native stone type B or crushed aggregate surfacing, rein.-con. bridge, 9,452 ft. Legislative Route 52020, Sect. 3, Ulysses Twp., Potter Co.; rein.-con. paving, widening, bituminous surface course, 5,014 ft. Legislative Route 77, Sect. 10, Traffic Route 18, Taylor and Union Twps., New Castle, Lawrence Co.; rein.-con. paving, rein.-con. arch, 2 rein.-con. bridges, bituminous on native stone type A or crushed aggregate surfacing 12,355 ft. Legislative Route 223, Sect. 3, Traffic Route 403, East Wheatfield, Jackson and West Taylor Twps., Indiana and Cambria Counties (bids 9/5 rejected. CD 9/8—ENR 9/11, under LB); bituminous on native stone type A or crushed aggregate surfacing 4,024 ft. Legislative Route 180, Spur E, Sect. 1, Ridley Twp., Ridley Park Boro, Delaware Co.; rein.-con. paving, widening 1,668 ft. Legislative Route 129, Sect. 3, Traffic Route 230, Middletown Boro, Swatara Twp., Dauphin Co.; bituminous on native stone type B or crushed aggregate surfacing, 3 rein.-con. structures, 2 rein.-con. bridges 25,021 ft. Legislative Routes 10020, Spur E, 10020, 10126, 10019, Sect. A, 10019, Sect. B, Saxonboro, Penn and Jefferson Twps., Butler Co.; rein.-con. paving, bituminous on concrete surfacing 2,550 ft. Legislative Route 120, Sect. 17, Traffic Routes 22 and 30, Wilkinsburg Boro, Braddock Twp.; rein.-con. paving 504 ft. Legislative Route 108, Sect. 7, Traffic Route 19, Bridgeville Boro, both Allegheny Co. T. C. Frame, c/o owner, ch. engr.

Bids Asked October 7

Indiana—State Hy. Comn., J. D. Adams, chn., Indianapolis, concrete widening 11.95 mi. Fort Wayne Hy. Dist., Rd. Contr. M-2241, Miami and Wabash Counties; 19.4 mi. same road, Rd. Contr. M-2242, Kosciusko and Elkhart Counties; 14.1 mi. same hy., Rd. Contr. M-2243, Allen and Whitley Counties; 18.7 mi. same road, Rd. Contr. M-2244, Elkhart and Lagrange Counties; 6.55 mi. Laporte Hy. Dist., Rd. Contr. M-2246, Lake Co.; 4.3 mi. Greenfield Hy. Dist., Rd. Contr. M-2248, Morgan, Hendricks and Marion Counties; 17.79 mi. Fort Wayne Hy. Dist., Rd. Contr. M-2240, Wabash and Huntington Counties; concrete paving, shoulder widening 8.907 mi. Rd. 46, Rd. Contr. Proj. 705 A, Vigo and Clay Counties; rein.-con. paving 0.606 mi. State Rd. 6, hy. and 1.598 mi. State Rd. 35, near Kingsbury, Rd. Contr. 208-A, LaPorte Co.; 3.7 mi. Vincennes Hy. Dist., Rd. Contr. M-2249, Spencer Co.; 2.74 mi. LaPorte Hy. Dist., Rd. Contr. M-2245, Lake Co.; 4.651 mi. State Rd. 52, rural dist., Rd. Contr. 74-B, Boone Co.; 0.649 mi. State Rd. 31, Rd. Contr. 21 B, Clark Co.; bituminous widening 21.47 mi. LaPorte Hy. Dist., Rd. Contr. M-2247, Carroll and Cass Counties. M. W. Keefe, c/o owner, engr.

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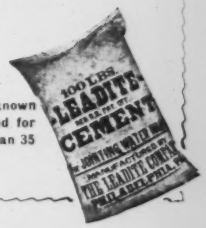

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STREETS, etc. (Bids Asked, Cont'd.)

Bids Asked October 8

New York—A. W. Brandt, supt. P. Wks., Albany, bys., bridges, railroad grade crossing elimination projects, Bronx, Cattaraugus, Orange, Schenectady, Montgomery, Steuben and Suffolk Counties; adv. ENR Sept. 25.

Bids Asked October 10

Kentucky—Dpt. Hys., Frankfort, grading, draining, low type surfacing 0.702 mi. also concrete bridge, approaches at Tygart Creek, Fullerton-Warnock Gesling Rd., Greenup Co.; grading, draining, high type surfacing 1.77 mi. Paintsville-Louisa Rd., Johnson Co., 1 mi. Bowling Green-Cave City Rd., Warren Co.; grading, draining, low type surfacing 3.076 mi. Beaver Lick-Big Bone Rd., Boone Co.; roadside imprv. 1.675 mi. Paducah-Benton Rd., McCracken Co.; high type surfacing 0.274 mi. street in Paris on Paris-Georgetown Rd., Bourbon Co.; medium type surfacing 2.029 mi. Burkesville-Ida Rd., and 6.25 mi. Albany-Columbia Rd., both Clinton Co.

Bids Asked October 15

Louisiana—Dpt. Hys., Baton Rouge, concrete paving 0.586 mi. Cameron-East Hy., S.P. 913-03-36, Routes 42 and 104, Cameron Parish. Extended date. CD 8/25—ENR 8/28.

Bids Asked

North Carolina—State Hy. & P. Wks. Comn., Raleigh, rejected bids Sept. 18, imprv. 10.61 mi. U. S. 17, between Williamston and Beaufort Co. line, Proj. 1541, Martin Co. $25,000-$50,000. Will readvertise. W. V. Baise, Raleigh, engr. CD 9/9—ENR 9/11.

O., Euclid—Thompson Products Co., c/o Ackerman, in charge, 2196 Clarkwood Rd., concrete roadwork and surfacing, parking area of site new factory buildings, over $200,-000.

†Oregon—Pub. Roads Admin., 316 New Post Office Bldg., Portland, rejected bids Sept. 17, imprv. Klamath Falls-Lakeview Hy., Fremont Natl. Forest, Lake Co., Project 30, A2, E. CD 9/9.

Virginia—Dpt. Hys., Richmond, rejected bids Sept. 9, imprv. 0.4 mi. hy. Fauquier Co. Will readvertise. CD 9/11—ENR 9/18 under LB.

Ont., Ottawa—Suburban Roads Comn., 279 Carling Ave., rescinded contract road repairs, etc., Hogs Back Rd. $113,900. CD 8/8—ENR 8/14, under CA.

LOW BIDDERS

Arizona—State Hy. Comn., Phoenix, Sept. 16, imprv. 6 mi. Cochise Co., from White & Miller Constrs., Inc., St. Marys Rd., Tucson. **$177,007.** CD 9/4.

Arkansas—State Hy. Dpt., Little Rock, imprv. 7.6 mi. Eudora-La. Line Rd., and 12.4 mi. Eudora-Lake Village Rd., both Chicot Co., to W. W. Keaton, Canton, Miss. **$58,720** and **$81,576** respectively, est. $80,000 and $120,000 respectively***9.2 mi., Cleveland and Bradley Counties, to S. M. Dixon, Warren, **$128,656** est. $140,000***5.3 mi. Yell Co., to Pioneer Constr. Co., Inc., Malvern, **$52,865**, est. $60,000. Grand tatol $321,817. Bids 9/18. CD 9/10.

Calif., San Mateo—City Clerk, Sept. 16, imprv. Terrace Gardens, R.1.41-15, from L. C. Smith, 3 and Railroad Aves., **$28,182.** Est. $40,000. CD 9/11.

Colorado—State Hy. Dpt., Sept. 9, imprv. 8.557 mi. Morgan Co., from E. Selander, Greeley. **$73,315.** CD 9/4.

Connecticut—W. J. Cox, state hy. comr., State Office Bldg., Hartford, Sept. 15, imprv. 5,507 ft. hy., New Haven, East Haven and Branford, from D. V. Frione & Co., Inc., 87 Foxon Rd., New Haven, **$125,621*****9,920 ft. Hartland, from White Oak Excavators, Inc., 59 E. Main St., Painville, **$69,766.** Cancelled bids Sept. 15, imprv. 12,000 ft. Southbury. CD 9/5 and 9/8—ENR 9/11.

★**Kentucky**—Dpt. Hys., Frankfort, Sept. 19, imprv. 10.324 mi. Hardin Co., from W. C. & A. Snider, Danville and Nally & Mudd, Danville, Springfield, **$205,101*****2.797 mi. Henderson Co., from N. E. Stone & Co., Madisonville, **$90,138*****11.501 mi. Henry Co., from Allen-Codell Co., Inc., Winchester, **$30,098*****3.945 mi. Jefferson and Hardin Counties, from L. G. Arnold, Inc., Eu Claire, Wis., **$273,578***four 40 ft. concrete span bridge, Pike Co., from Codell Contr. Co., Winchester, **$25,448.** CD 9/4—ENR 9/11.

New Hampshire—State Hy. Dpt., Concord, Sept. 18, 4 in. gravel surfacing 2.775 mi. Merrimack Co., from R. G. Watkins & Son, Inc., Amesbury, Mass. **$47,015.** Est. $50,000. CD 9/5—ENR 9/11.

New Hampshire—State Hy. Dpt., Concord, Sept. 11, 3 in. road mix on gravel surfacing 1.629 mi. Merrimack Co., from Charter Oak Constr. Co., Hartford, Conn., **$82,272.** Est. $73,000. CD 9/5.

★**North Carolina**—State Hy. & P. Wks. Comn., Raleigh, Sept. 18, imprv. 11.87 mi. Burke and Catawba Counties, from Kiker & Yount, Reidsville, **$172,054** est. $250,000-$300,-000***6.49 mi. Iredell Co., from Propst Constr. Co., Concord, **$50,724** est. $25,000-$50,000*** 1.08 mi. Durham Co., from J. P. McGuire, Durham, **$67,464**, est. $50,000-$75,000***3.96 mi. Bladen Co., from Beal Bros., Bear Creek, **$42,438**, est. $25,000-$50,000***9.73 mi. Johnston Co. and 8.53 mi. Pitt Co., from E. W. Grannis, Fayetteville, **$105,467** and **$56,109** respectively, est. $100,000-$125,000 and $50,000-$75,000 respectively***State Hy. Dpt., Raleigh, received no bids Sept. 18, imprv. 4.7 mi. Yancey Co., $125,000-$150,000. CD 9/9 and 9/10—ENR 9/11.

Maryland—State Roads Comn., Baltimore, Sept. 16, imprv. service roads, Contr. W-1502-6-152, Worcester Co., from Williams Distr. Co., Middle River, **$179,627.** CD 9/10.

†Mo., Jefferson Barracks—U. S. Engr., St. Louis, U. S. Court House and Custom House, St. Louis, Sept. 12, asphalt, concrete or bituminous macadam surfacing waterbound macadam roads and parking areas, from Crandwood Contg. Co., 7952 S. Rock Hill Rd., St. Louis. **$47,251.**

North Carolina—State Hy. & P. Wks. Comn., Raleigh, Sept. 16, imprv. 4.96 mi. [illegible] Mecklenburg Co., from Blyth Bros. Co., Inc., 425 S. Brevard St., Charlotte. **$36,135.**

★**Pennsylvania**—State Hy. Dpt., [illegible] Hughes, secy. Harrisburg, Sept. 19, imprv. 7,749 ft. Armstrong Co., from B. Ferraro, 209 Ligonier St., Latrobe, **$228,327***28,758 ft. Bradford Co., from A. W. Hinaman, Williamsport, **$277,217***12.579 ft. Carbon Co., from Jos. Banks Constr. Co., 307 Central Bldg., Wilkes-Barre, **$248,346***28,853 ft. Centre Co., from D. E. Smith, R.D. 1, Berlin, **$187,300***18,128 ft. Cumberland Co., from Walker Bros., 36 Hood St., Chambersburg, **$234,175***7,267 ft. Montgomery Co. from C. Riebe, Lansford, **$109,823***19,778 ft. Somerset Co., from Laub & Collins, P. O. Box 8606, Wilkinsburg, $320,-601***650 ft. Washington Co., from F. C. Patterson, I St. and Meldon Ave., Donora, **$26,359.** CD 9/8—ENR 9/11.

CONTRACTS AWARDED

Ark., Augusta—Woodruff Co., imprv. roads, **WPA. $93,798.**

Calif., Berkeley—Imprv. streets, University Gardens, to L. J. Immel, Box 65, Station A, **$37,148.** CD 9/11—ENR 9/18.

Calif., Richmond—Imprv. 1.016 mi. 23 St., to W. H. Larson, 6015 Chabalyn Terrace, Oakland, **$25,370.** CD 9/11—ENR 9/18.

Calif., San Francisco—Property owners, c/o contractors, grading, asphaltic concrete paving, vitr. sewers, property on frontages affected 32 Ave. between Pacheco and Quintara Sts., to C. L. Harney, Call Bldg. **$26,135.**

Calif., San Mateo—Imprv. streets Parrott Park Subdivision, R.I. 41-16, to L. C. Smith, 3 and Railroad Aves., Schedule A **$41,049**; imprv. in Mason Tract, to Union Paving Co., 310 California St., San Francisco, **$26,528.** Bids about 9/16. CD 9/11.

†Conn., Groton—Federal Wks. Agency, 7 and D Sts. S.W., Wash., D. C., grading, roads, drainage, sewers, disposal plant, Shennecossett Rd., for housing, to N. Benvenuti & Sons, 6 Elm St., New London. Est. **$30,000.** Payne & Keefe, 231 State St., New London, archts.

★**Georgia**—State Hy. Bd., W. E. Wilburn, bd. chn., Atlanta, to Pittman Constr. Co., 537 Plaster Rd., Atlanta, imprv. 5.659 mi. hy. Jackson Co., **$173,491** est. $146,000*** to R. A. Bowen, Macon, 3.853 mi. hy. Monroe Co., **$47,449** est. $38,000***to R. G. Foster & Co., Decatur, 0.454 mi. Washington Co., $32,-615 est. $26,000; 8.278 mi. hy., 1 bridge, Warren and Jefferson Counties, **$111,673** est. $120,000; 3.452 mi. Polk Co., **$88,934** est. $82,000 *** to Ledbetter-Johnson Contractors, Rome, 3.096 mi. Warren Co., **$29,482** est. $18,000***to L. T. Barber, Moultrie, 5.22 mi. Bleckley Co., **$75,122** est. $74,000***to John Monaghan Inc., Pelham, 3.822 mi. Crawford Co., **$66,608** est. $62,000. State Hy. Dpt., Atlanta, withdrew bids 9/12 for imprv. 2.873 mi. hy., Jasper Co. Grand total $625,374. CD 8/28—ENR 9/4.

†Ga., Atlanta—Con. Q.M., grading, utilities, Lawson General Hospital, Camp Gordon, to Nichols Contg. Co., 1190 Caroline St. N.E. **$39,533.**

Ia., Mt. Pleasant—Henry Co., crushed stone surfacing 28,000 cu. yd. roads, to Concrete Materials & Constr. Co., Cedar Rapids, $39,900. Est. $40,000. Bids 9/16. CD 8/25—ENR 8/28.

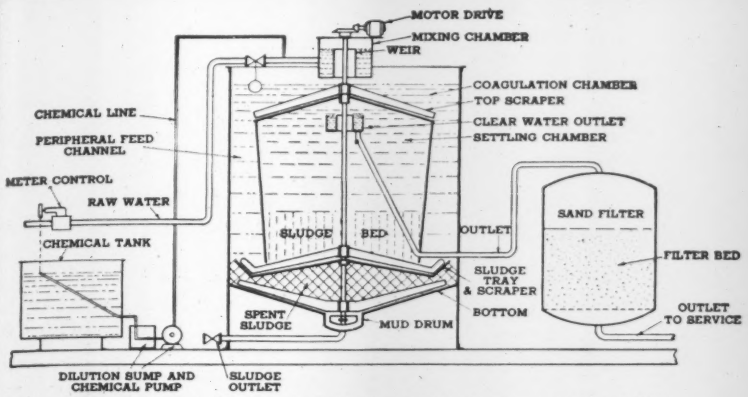
Kentucky — Dpt. Hys., Frankfort, imprv. 11.395 mi. Russell and Casey Counties, to Gorman Constr. Co., Flemingsburg, $166,995; 7.843 mi. Metcalfe Co., to J. F. Pace Const. Co., Marrowbone, **$75,040.** CD 8/27—ENR 9/4, under LB.

Kentucky—Dpt. Hys., Frankfort, bituminous surfacing 5.705 mi. Covington-Lexington Rd., Boone Co., to H. K. Williams, 1326 S. 7 St., Louisville. **$42,691.** Bids 9/16.

Maine—State Hy. Comn., L. D. Barrows, ch. engr., Augusta, imprv. 1.27 mi. hy. Saco and Old Orchard Beach, to Bridge Constr. Corp., 335 Water St., **Augusta, $45,925;** 2.01 mi. Edmunds, to T. DiCenzo, 67 Lincoln St., Calais, **$84,352.** Bids 9/10, awarded 9/15. CD 9/8.

Me., South Portland (br. Portland)—Office City Manager, City Hall, imprv. 11,000 sq. yd. Sawyer St., to Warren Bros. Co., 38 Memorial Dr., Cambridge, Mass., approx. **$25,000.** Bids 9/16. CD 9/12.

†Massachusetts — Con. Q.M., First Army Corps., Boston, roads, drainage sys., concrete walls, steps, Forts Strong, Warren and Andrews, Boston Harbor, to John McCourt Co., 910 Huntington St., Boston, and John P. Condon Corp., Coolidge Hill, Watertown, **$211,797.** Bids 7/26. CD 7/24.



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Los Angeles Dallas San Francisco

STREETS, etc. (Contracts Awarded, Cont'd.)

Massachusetts—Dpt. P. Wks., H. L. MacDonald, comr., 100 Nashua St., Boston, imprv. 15,290 sq. yd. Brookline, to C & R Constr. Co., 75 Bradeen St., Roslindale, **$58,431;** 14,200 sq. yd. Haverhill, to John A. Gaffey & Son, 19 James St., Medford, **$38,796.** Bids 9/9, awarded 9/17.

†**Mass., Boston** — Con. Q.M., First Army Corps, Boston, roads, drains, concrete wall, steps, Fort Standish, to E. P. Breen, Minot, **$42,490.**

Mass., Falmouth—Commonwealth of Massachusetts, Dpt. P. Wks., H. L. MacDonald, comr., 100 Nashua St., Boston, hy. and bridge, FAGH 191 B(2), Falmouth Co., to Forrest Constr. Co., 60 Lenox St., Norwood. **$80,210.** Bids 7/15, awarded 9/15. CD 7/2—ENR 7/10.

Minn., Madison Lake—C. J. Hoehn, city clk., curbing, guttering, watermains, sewers. **WPA. $57,521.**

Minn., Montevideo—A. E. Swenson, city clk., street grading, curbing, sidewalks, watermains, storm sewers. **WPA. $178,140.** M. E. Chamberlin, city engr.

Minn., Roseau—Roseau Co., O. A. Brager, aud., constructing, imprv. roads. **WPA. $261,544.** H. Paine, Roseau, co. hy. engr.

Minn., St. Cloud—Street imprvs., curbing, sidewalks. **WPA. $70,310.** A. J. Haberkorn, city clk.

Missouri—State Hy. Comn., Jefferson City, imprv. 0.161 mi. Christian Co., to Neyer Constr. Co., Billings, **$28,652.** Bids 9/5. Rejected bids Sept. 5, imprv. 2.273 mi. Ripley Co., 173.5 mi. Audrain, Monroe, Pike, Ralls and Shelby Counties; 4.016 mi. Gasconade Co.; 4.43 mi. Gasconade Co.; 3.433 mi. Adair Co. CD 9/10, under LB—ENR 8/28.

†**Montana**—Pub. Roads Admin., Missoula, imprv. 1.326 mi. Rogers Pass Hy., Helena Natl. Forest, Lewis and Clark Co., to S. Birch & Sons, Constr. Co., Ford Bldg., Great Falls, **$83,813.** Bids 9/19. CD 9/9—ENR 9/11.

Mont., Missoula—Missoula Co., W. J. Babington, clk., road imprvs. **WPA. $98,859.**

N. J., Bayonne—Grading, granite block paving Avenue A, **WPA. $70,967.** H. A. Jaeger, City Hall, WPA and city engr.

†**N. J., Fort Dix**—Con. Q.M., sidewalks, 30 mi. compact gravel sidewalks, to Robert W. Cleveland & Co., 19 N. Harrison St., East Orange. **$30,500.**

Ohio—State Hy. Dpt., Columbus, imprv. 5.371 mi. Allen Co., to Churchill Bros., 334 S. Jamison Ave., Lima, **$119,968,** est. $121,000*** 4.767 mi., Clermont Co. to Scully Bros., Atlas Bank Bldg., Cincinnati, **$75,542,** est. $70,100*** 1.278 mi. Lawrence Co., to Middle States Bituminous Corp., P. O. Box 267, Ironton, **$51,904,** est. $52,000. Grand total $242,414. Bids 9/16. Received no bids Sept. 16, imprv. 0.433 mi. Sect. East Palestine of SH 89, Columbiana Co.; 1.677 mi. Sect. Grafton of SH 314, and Sect. Oberlin, Lorain Co. Cancelled bids to have been opened Sept. 16, imprv. 0.113 mi. and building concrete beam bridge on concrete substructures over branch East Fork Mill Creek, widening, resurfacing, Sect. A of SH 922. CD 9/5—ENR 9/11.

O., Toledo—J. H. Jewhurst, dir. P. Wks., widening, paving sections Erie and Columbus Sts., to S. E. Johnson Co., 218 Terminal Bldg. **$65,654.** Bids 8/26. C. L. Piper, city engr.

†**Okla., Fort Sill**—Con. Q.M., road building and drainage work, to Park-Ward Co., Colcord Bldg., Oklahoma City. **$133,242.**

★**Pennsylvania** — State Hy. Dpt., T. C. Frame, ch. engr., Harrisburg, imprv. 23,740 ft. hy., Bradford Co., to A. B. Cole, Meshoppen. **$541,433.** Bids 8/29. CD 9/16, under LB.

★**Pa., Munhall**—Boro, J. H. Percival, secy., Boro Bldg., road repairs, resurfacing, widening, etc. **WPA. $1,020,000.** F. B. Schaeffer, Boro Bldg., boro engr.

Tex., Fort Worth—S. H. Bothwell, city mgr., imprv. Hemphill St., to General Constr. Co., c/o Electric Bldg. **$29,703.** Bids 8/28. CD 8/15—ENR 8/21.

Tex., Galveston—Galveston Co., c/o Judge, Galveston, drainage ditches and road topping. **WPA. $51,618.** C. C. Washington, co. engr.

Utah, Price—Street and WW imprvs., **WPA, $206,094.** B. Turner, Price, engr.

†**Va., Camp Lee**—Con. Q.M., constructing sidewalks, to Virginia Asphalt & Paving Co., Petersburgh, **$56,000;** hard standing areas for parking, to Maguire Constr. Co., Durham, N. C., **$35,000.**

Vt., Townsend—State Hy. Dpt., H. E. Sargent, ch. engr., Montpelier, imprv S.P. 159-P, to F. J. Fabian, Main St., Poultney. **$45,807.** Bids 9/5, awarded 9/15. CD 8/28—ENR 9/4.

★**Wyoming**—State Hy. Comn., F. Kelso, supt., Cheyenne, imprv. 6.461 mi. hy., bridges, Park Co., to Taggart Constr. Co., Cody, **$157,703***** 12.683 mi. Fremont Co., to Peter Kiewit Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, Neb., **$358,891***** 10.834 mi. Crook Co., to J. J. Dooling, 1133 Oneida St., Denver, Colo., **$117,725***** 17.271 mi. Campbell Co., to Big Horn Constr. Co., Sheridan, **$174,037.** Grand total $808,356. Bids 9/16, awarded 9/16. CD 9/5.

†**Wyo., Fort Francis E. Warren**—Con. Q.M., 24 mi. roads, to A. H. Read, 706 W. 19 St., Cheyenne. **$30,917.** Bids 9/2, awarded 9/2.

Quebec—Dpt. Roads, Quebec, grading, graveling, 6.2 mi. Arvida-Le Kenogami Rd. and Hy. 16, to Massicotte and Fils, Cap de La Madelein, **$250,000;** 5.8 hy. between St. Flavien and Fisandon on Quebec-Montreal-York Hy., to Union Quarries & Paving Ltd., 3 Charest Blvd., Quebec City, **$96,000.**

Quebec—Dpt. Roads, Quebec, terra[illegible] constructing 3 mi. municipal roads Abercrombie and Kilkenny Twps., Terrebonne Co., to Lakeshore Constr. Co., Ltd., 137 Carr Ave., Pointe Claire, **$26,000;** paving 2.4 mi. Hy. 8 and municipal roads, Papineau and Pontiac Counties, to Provincial Constr. Co., Ltd., 2750 Hill Park Rd., Montreal, **$26,200.**

Quebec—Province of Quebec, Quebec City, grading 16.4 mi. road, Iberville, to P. Gaillargeon, Ltd., 264 Champlain St., St. Jean, **$48,500;** bituminous paving 5 mi. hy., Brownsburg, to Provincial Constr. Ltd., 2750 Hill Park, Montreal, **$27,000.**

Quebec—Dpt. Roads, Quebec City, grading, graveling 9.9 mi. Courville Hill-Montmorency and Courville Div. hy., Courville to Ste. Marie, 61 St. Cleophas Co., Beauport, **$59,793.**

Que., La Tuque—Shawinigan W. & P. Co. Ltd., 107 Craig St. W., Montreal, road construction to La Franche, to A. Dubois, Notre Dame St. Est. **$30,000.**

EARTHWORK, WATERWAYS

PROPOSED WORK

★†**Calif., Los Angeles**—U. S. Eng., 751 S. Figueroa St., additional protection from flood waters Los Angeles River, completion chanel from Lankershire Blvd. to Stewart and Gray Rd. Est. cost $14,000,000 for new construction and remainder of work now under way.

Calif., Los Angeles — Los Angeles County Flood Control Dist., 751 S. Figueroa St., excav. 1.5 mi. Dominguez Channel, constructing timber bridge, bulkheads, etc. $50,000 H. E. Hedger, 751 S. Figueroa St., engr.

Calif., Paradise—Paradise Irrigation Dist. voted $140,000 bonds, steel pipeline.

Idaho, Gooding—American Falls Reservoir Dist. 2, Gooding, concrete lining 20 mi. Milner-Gooding Irrigation canal. Over $30,000.

†**Missouri**—U. S. Eng., 601 Davidson Bldg., Kansas City, 4,000 ft. revetment, 1,190 ft. accretion paving, removing 2,820 ft. pile dikes from Missouri River at Camden Bend, near Napoleon. $100,000.

†**N. J., Bayonne**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., filling in 27 additional acres of land, Naval Supply Depot.

†**N. Y., Buffalo**—U. S. Eng., 540 Federal Bldg., maintenance and imprv. existing river and harbor works, Buffalo Harbor, Cir. Pro. 138-42-21. $170,000.

†**N. Y., Irving**—U. S. Eng., Buffalo, harbor for light draft vessels at mouth Cattaraugus Creek where it flows into Lake Erie.

South Carolina—South Carolina Pub. Serv. Auth. Charleston, new bids soon finishing work, Pinopolis powerhouse, Santee-Cooper project. Former bids rejected. CD 9/4—ENR 9/11.

S. D., Lake Norden—State Fish & Game Comn., Pierre, diversion ditch and dam, Lake Poinsett. $131,000.

BIDS ASKED

Bids Asked October 2

†**Connecticut**—U. S. Eng., Providence, R. I. 133,000 cu. yd. maintenance dredging, Mystic River; adv. ENR 9/25.

Bids Asked October 7

Pa., Pittsburgh—Comrs. Allegheny Co., R. G. Woodside, controller, County Office Bldg., Riverfront Boulevard improvement, Duquesne Way; Contr. 13, superstructure for underpass under westbound roadway, near Fancourt St., altering south approaches of 6, 7 and 9th St. Bridges; Contr. 15, furnishing, erecting handrailing; Contr. 16, furnishing light, trolley and traffic signals, poles, accessories. Lew Burd Duff, County Office Bldg., engr.

Bids Asked On or About October 8

†**Arkansas**—U. S. Eng., Gay Bldg., Little Rock, 60,000 cu. yd. levee embankment, left bank Arkansas River, Crawford Levee Dist., near Van Buren.

Bids Asked October 8

†**Texas**—U. S. Eng., Federal Bldg., Galveston, three 541 ft. concrete sheet pile retaining walls, with concrete caps, etc., in Calhoun and Matagorda Counties, in vicinity Port O'Connor; adv. ENR 9/25.

Bids Asked October 9

†**Texas**—U. S. Eng., Galveston, dredging 3,000,000 cu. yd. Sabine Pass jetty channel, Sta. 100 plus 00 to Sabine Pass Channel, Sta. 280 plus 00, incl. Sabine Pass Anchorage; adv. ENR 9/25.

Bids Asked October 13

†**Utah**—Bureau Reclamation, Provo, Utah, earthwork, concrete lining, structures, Sta. 424 plus 81 to Sta. 478 plus 90, Weber-Provo Diversion Canal, Deer Creek Div., Provo River Project, near Kamas, Spec. 990; adv. ENR 9/25.

EARTHWORK, etc. (Bids Asked, Cont'd.)

Bids Asked October 17

†**Pa., Plymouth**—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., design, manufacture, test and delivery motor driven pump. units and electrical switchgears for pump. station; adv. ENR 9/25.

LOW BIDDERS

†**California**—U. S. Eng., 208 Post Office Bldg., Sacramento, Sept. 16, enlarging, raising, strengthening, setting back 30,500 ft. levee along West Levee of Sutter By-Pass from 1 mi. above mouth northerly about 5.8 mi., from N. M. Ball Sons, P. O. Box 404, Berkeley. **$353,197.** CD 9/11—ENR 9/18.

†**La., New Orleans**—U. S. Eng., foot of Prytania St., Sept. 15, removing, disposing approx. 272,000 cu. yd. material from Mississippi River in New Orleans Harbor, from Standard Dredging Co., 80 Broad St., New York, N. Y., **$27,118.** CD 9/3.

†**Nebraska**—U. S. Eng., 1709 Jackson St., Omaha, Sept. 18, 8,000 ft. revetment Missouri River between Sioux City and Winnebago Bends, 7 mi. from Homer, from Woods Bros. Constr. Co., 504 S. 18 St., Omaha, **$183,069.** Est. $199,237. CD 9/3—ENR 9/11.

★†**Nebraska**—U. S. Eng., 1709 Jackson St., Omaha, Sept. 17, 8,970 ft. revetment Missouri River between Peru and Rulo Bends, near Nishnabotna, from Massman Constr. Co., 737 New York Life Bldg., Kansas City, Mo., **$174,134,** est. $182,712•••12,448 ft. revetment Missouri River between Papillion and Nishnabotna Bends, 6 mi. from Nebraska City, from Kansas City Bridge Co., 215 Pershing Rd., Kansas City, Mo., **$215,813,** est. $244,257 •••15,314 ft. revetment Missouri River between Snyder and Louisville Bends, 10 mi. from Decatur, from W. P. McGeorge, Box 995, Pine Bluff, Ark., **$269,951,** est. $344,431. CD 9/3—ENR 9/11.

†**Tenn., Memphis**—U. S. Eng., P. O. Box 97, Memphis, Sept. 16, 990,000 cu. yd. earthwork and corrugated metal culvert, Lower St. Francis Levee Dist., from Driver Contg. Co., Cotton Exch. Bldg., and S. K. Jones Constr. Co., Sterick Bldg. **$190,203.** CD 9/3.

†**Vt., Burlington**—U. S. Eng., Whitehall Bldg., 17 Battery Pl., New York, N. Y., Sept. 18, repairing, improv., 130 lin. ft. stone protection mound in breakwater, from Champlain Transportation Co., 181 Battery St., Burlington, **$21,423.** CD 8/19—ENR 8/21.

†**Washington**—Bureau Reclamation, Denver, Colo., Sept. 12, fabricated structural steel for steel structures for left 230 kv. switchfield at Grand Coulee power plant, Spec. 1587-D, from Lehigh Structural Steel Co., 17 Battery Pl., New York, N. Y. **$62,240.** CD 8/25—ENR 8/28.

CONTRACTS AWARDED

Calif., Long Beach—State Hy. Dpt., C. H. Purcell, engr., 808 State Bldg., Los Angeles, excavating 900,000 cu. yd. silt and sand from bed of Los Angeles River. Owner builds. Approx. **$100,000.**

La., Hosston—Bd. Comrs. Caddo Levee Dist., Shreveport, enlarging Kelly Bayou, near here, to H. B. Hornsby, Bossier City. **$31,920.** Bids 9/16, awarded 9/16. CD 9/3.

†**Neb., Rulo**—U. S. Eng., 1709 Jackson St., Omaha, 1,728 ft. standard revetment with combination mattress in Missouri River, Rush Bottom Bend, hired labor and government plant. **$39,000.** CD 9/10—ENR 9/18.

★†**N. Y., Corning**—U. S. Eng., Security Mutual Bldg., Binghamton, flood protection project, Sect. 2, to H. F. McLean Constr. Co., Inc., 8 Church St., White Plains. **$697,892.** Bids 8/14, awarded 8/21. CD 8/15—ENR 8/21.

N. Y., New York—Comr. Parks, at office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., Sept. 11, dredging Sound View Park, Contr. X-118-341, Bronx Boro, from Jos. McSpirit & Sons, Inc., 40 Glenwood Ave., Jersey City, N. J. **$23,680.** CD 9/9.

†**Ohio**—War Dpt., 20 St. and Constitution Ave., N.W., Wash., D. C., dredging 198,000 cu.yd. Ohio River, Firebrick Bar, 4.4 mi. from Portsmouth, to O. N. Floyd, Burt Bldg., Dallas, Tex., **$30,492.**

Man., The Pas—Ducks Unlimited, Bank of Commerce Bldg., Winnipeg, dam and substructure, to Macaw & MacDonald, Scott Bldg., Winnipeg. **$25,000.** Bids 7/25. CD 7/12—ENR 7/18.

Sask., Val Marie—Prairie Farm Rehabilitation Admin., 910 McCallum Hill Bldg., Regina, drains, dykes, canals, pump house, etc. West Val Marie Irrigation Project, to Poole Constr. Co. (Saskatchewan) Co. Ltd., Hamilton and 8 Sts., Regina. **$55,000.**

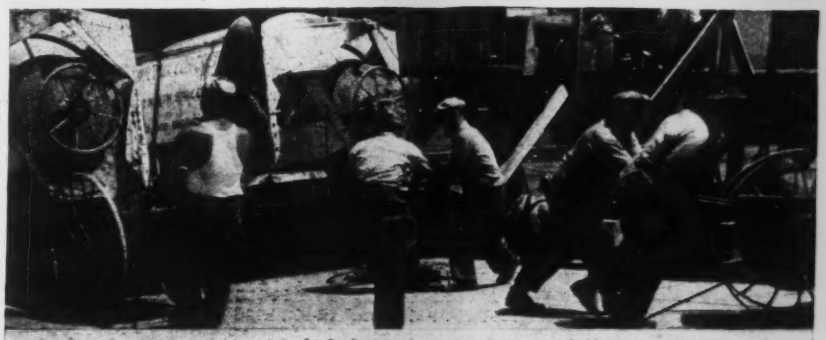
Que., St. Laurent—Noorduyn Aviation Co. Ltd., St. Laurent, grading, excav., etc., plant, to Cook & Leitch, Ltd., 1440 St. Catherine St. W., Montreal. **$32,000.**

UNCLASSIFIED

PROPOSED WORK

†**Ariz., Higley**—GAS FUELING SYSTEM—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., indefinitely postponed bids to have been opened Sept. 12, A. C. gas fueling sys., Mesa Military Airport. CD 9/3.

PRE-FABRICATED



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UNCLASSIFIED (Proposed Work, Cont'd.)

†Calif., March Field—AIR FORCE HEADQUARTERS BUILDING—U. S. Eng., 751 S. Figueroa St., Los Angeles, 2 story headquarters bldg. $100,000.

Calif., Oxnard—AIRPORT—U. S. Eng., 751 S. Figueroa St., Los Angeles, indefinitely postponed bids to have been opened Sept. 9 grading, paving, airport, Inv. 51, Program B. CAA. Over $25,000. CD 8/22—ENR 8/28.

Calif., Red Bluff—AIRPORT—U. S. Eng., 208 Post Office Bldg., Sacramento, landing strip, runways, etc., municipal airport.

Colorado—TRANSMISSION LINES — Intermountain Rural Electric Assn., Bailey, 24.3 mi. transmission lines. $39,000 REA allot. G. R. Fickel, 518 Temple Court, Denver, engr. CD 9/4—ENR 9/18.

Georgia—RURAL ELECTRIC LINES—Colquitt County Rural Electric Co., Moultrie, J. H. Haplert, supt., 12 mi. transmission lines to serve 2 army air bases, $75,000; 328 mi. line addn. to present system. $245,000. REA allot.

Ga., Decatur — SWIMMING POOL, etc. — Comrs. DeKalb Co., Decatur, swimming pool and recreation pool, Camp Gordon, $100,000; recreation center, Decatur, $80,000. W. McDonald, Beutell-McDonald and Robert & Co., Bona Allen Bldg., Atlanta, engrs.

Illinois—TRANSMISSION LINE—Miss R. Power Co., P. O. Box 513, Keokuk, Ia., 69,000 volt 3 phase transmission line on its private right-of-way, Hancock and Adams Counties. $294,000.

Illinois—RURAL ELECTRIC LINES—Pub-Serv. Co. of N. Illinois, 72 W. Adams St., Chicago, 49 mi. rural electric lines, various counties, F. E. Andrews, 72 W. Adams St., Chicago, engr. of elec. distr.

Illinois—RURAL ELECTRIC LINES—Illinois Northern Utilities, Dixon, 41.65 mi. rural electric lines, Ogle, Carroll, Lee, Kendall, La Salle, De Kalb, Bureau, Henry, Whiteside, Mercer, Jo Davies, and Stephenson Counties. C. J. McLean, Dixon, constr. engr.

Illinois—GAS PIPE LINE—Southeastern Illinois Gas Co., Vandalia, R. L. Seiben, genl. mgr., natural gas pipeline from Brownstown to Vandalia. $30,000.

Ill., Quincy — AIRPORT — Voted $200,000 bonds, airport. $300,000. Will seek federal funds.

Iowa—RURAL ELECTRIC LINES—Pocahontas County Rural Electric Lines, Pocahontas, bids soon 91 mi. rural electric transmission lines Pocahontas, Palo Alto and Kossuth Counties, $95,000. K. R. Brown, 803 Valley Bank Bldg., Des Moines, engr. CD 9/4—ENR 9/18.

Ia., Slater—LIGHT SYSTEM—P. Rood, city clk., voted $65,000 bonds, municipal light system.

Kan., Ottawa—AIRPORT—L. C. Geiger, mayor, preliminary plans airport, drainage, runways. $90,000. Paulette & Wilson, 1006 Kansas St., Topeka, engrs. CD 4/10—ENR 4/17.

Me., Bangor—Airport extens, landing strip NE/SW 500x4,500 ft., paved runway, basic and contact lighting. **WPA.** $250,000. W. Crowell, 142 High St., Portland, dir. Operations, WPA Officers.

Me., Boothbay Harbor—LOBSTER PLANT—State, Dpt. Sea and Shore Fisheries, Boothbay Harbor, lobster plant.

Mass., Quincy—ARENA—L. Abbott, et al, Granite City Ice Co., 550 Adams St., brick sports arena, South End. Over $25,000.

Mo., Kirksville—AIRWAY LANDING FIELD—Civil Aeronautics Admin., City Hall, Kansas City, enlargement, imprv. airway landing field.

Neb., Omaha—PARK—Bd. Educ., school athletic park, bleachers, track, football grounds, etc. $150,000. Applied to WPA. H. Korning, supt. John Latenser & Sons, 1307 Farnam St., archts.

†N. J., Fort Dix—FORT IMPROVEMENTS—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., fort imprvs., reconstructing bridges, removing old railroad relaying rails and ties, utilities, etc. $56,000. WPA.

†N. J., Fort Hancock (Highlands)—CAMP IMPROVEMENTS—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., excavating, grading, railroads, etc., $52,500, WPA.

N. Y., New York—BOAT HOUSE—Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., plans by A. Embury 2nd, 150 E. 61 St., 1 story boat house, Central Park, 110 St. near 5 Ave. $75,000.

N. C., Wilmington—RECREATION FACILITIES—J. G. Wallace, city mgr., recreation facilities. $150,000. Applied for DPW funds.

N. D., New England—SWIMMING POOL—Municipal swimming pool. $30,000.

O., Kenton—SWIMMING POOL, etc.—$65,000 bond election Nov. 4, municipal swimming pool and bath house, P. K. Strong, city engr. CD 8/13/40—ENR 8/15/40

O., Wellington—ELECTRIC LINES—Lorain-Medina Rural Electric Co-op., Wellington, 82 mi. rural electric lines, Lorain Co. $59,186. Putnam & Woolpert, Realty Bldg., Dayton, engrs.

Oklahoma—GAS PIPELINE—Oklahoma Natural Gas Co., 401 N. Harvey St., Oklahoma City, final plans 15 mi. 16 in. natural gas pipeline between Cement and Norge. $220,000.

Okla., Vinita—SUBSTATION, —Grand River Dam Auth., Vinita, substation, transmission line to serve Cookson Hills cantonment, to be built near Braggs. $1[illegible],000. Applied for PWA gr. W. R. Holway, Vinita, engr.

Pa., Lancaster—TROLLEY [illegible] REMOVAL—Conestoga Transportation Co. and City, removing trolley rails from [illegible] Belt street line, repaving afterwards. $30,000.

Pa., St. Mary's—AIRPORT—[illegible] Co., Court House, Ridgeway, county-owned airport, St. Mary's-Ridgeway [illegible] Over $25,000.

Tex., Arlington—AIRPORT—U. S. Eng., Denison, airport landing field, 2 concrete runways, 3,500 ft. and 4,500 ft., taxiways, etc. $490,000. CAA.

Tex., Bonham—PARK—Developing municipal park, grading, leveling, athletic courts, etc. $60,000.

Tex., Grand Prairie—SWIMMING POOL, etc.—Public health center, swimming pool, recreational facilities, etc. Applied for DPW funds.

Tex., Houston—SHIP WAYS—Platzer Shipbuilding & Dry Dock Co., c/o R. M. Farrar, pres., Union Natl. Bank, 2 new ways at Green's Bayou at entrance to ship channel. $300,000.

Tex., Tyler—AIRPORT IMPROVEMENTS—Airport imprvs., grading, etc. $383,000. CAA.

Wash., Aberdeen—RURAL ELECTRIC DISTRIBUTION SYSTEM—Grays Harbor Public Utility Dist., Aberdeen, 29 exten. to rural electric distr. sys. $140,000.

★**†Wash., Galena** — AIR CORPS REPAIR DEPOT—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., Army Corps Supply Depot for Air Force units in northwest, on 2,400 acre site, near here, 7 mi. west of Spokane. $20,000,000. CD 8/11—ENR 8/14, under Spokane.

†Wash., Seattle — ELECTRIC DISTRIBUTION SYSTEM—Con. Q.M., 1519 S. Alaskan Way, bids soon electric distr. sys. at military reservation.

★**Wash., Seattle**—LIGHT and POWER SYSTEMS—City Light, City Light Bldg., E. R. Hoffman, supt., exten. light and power distr. sys. $800,000. Seeking PWA funds. CD 3/6—ENR 3/16, under Public Bldgs.

Ont., Toronto—SHED—Canada Steamship Lines, Victoria Sq., Montreal, Que., extend shed accommodation on wharf. $60,000.

Ont., Wallaceburg—DOCK—Dominion Govt., Ottawa, dock exten. $50,000. Dpt. P. Wks., Ottawa, engrs.

★**Que., Arvida** — STORAGE DAM — Aluminum Co. of Canada, Ltd., 1010 St. Catherine St. W., Montreal, bids soon storage dam on Peribonka River in Lake St. John Dist. $3,000,000.

Yukon Territory, Fort St. John—HANGAR—Yukon Southern Air Transport Ltd., Fort St. John, hangar. $35,000.

Yukon Territory, Whitehorse — HANGAR — Yukon Southern Air Transport Ltd., Fort St. John, hangar. $40,000.

BIDS ASKED

Bids Asked After September 19

Okla., Tulsa—AIRPORT—U. S. Eng., 416 Wright Bldg., Tulsa, paving runways and taxiways, airport control tower, airfield for Aircraft Assembly Plant now under construction adjacent to municipal airport.

Bids Asked September 29

N. S., Shelburne—WHARF—Secy. Dpt. P. Wks., Ottawa, Ont., reconstructing public wharf. About $350,000. K. M. Cameron, c/o owner, engr.

Bids Asked October 1

†La., DeRidder—GASOLINE STORAGE and DISPENSING SYSTEM—U. S. Eng., foot of Prytania St., New Orleans, complete Air Corps gasoline storage and dispensing sys., DeRidder Airport.

★**†Tex., San Antonio**—HANGARS—U. S. Eng., Federal Bldg., Galveston, 3 steel hangars, Kelly Field. $585,000. CD 7/22—ENR 7/24.

Bids Asked October 2

N. S., Sydney—HANGARS, etc.—Secy. Dpt. Munitions & Supply, Ottawa, Ont., operational training unit, hangars, mess halls, living quarters, garages, etc. for Dpt. National Defense for Air, Ottawa, Ont. About $400,000.

Missouri — TRANSMISSION LINES — Three Rivers Electric Co-operative, Linn, 300 mi. transmission lines. $255,000. Extended date. REA. Frank Horton & Co., Lamar, engrs. CD 9/11—ENR 9/18.

Oregon — TRANSMISSION SYSTEM — Lane Co. Electric Co-operative, Odd Fellows Bldg., Eugene, 334 mi. transmission and distr. line sys., 4 substations, transformers, etc., Lane Co. $410,000. Bids 8/26 rejected. J. W. Cunningham, Spalding Bldg., Portland, engr. CD 8/22.

UNCLASSIFIED (Bids Asked, Cont'd.)

Pennsylvania and Maryland—RURAL ELECTRIC LINES—Somerset Rural Electric Co-operative Assn., R. A. Poorbaugh, pres., R. M. Fedrow, local mgr., Somerset, Pa., 82 mi. rural electric lines, Somerset and Fayette Counties, Pa., and Garrett Co., Md. $105,000. Putnam & Woolpert, 132 N. Main St., Dayton, O., engrs. CD 8/7—ENR 8/21.

Texas—Rusk County Co-operative, c/o W. R. Mehner, supt., 150 mi. rural electric lines, Gregg, Panola and Rusk Counties. $125,000. Freese & Nichols, Capps Bldg., Fort Worth, engrs. CD 9/16—ENR 9/18, under BA.

Bids Asked October 7

Pennsylvania—RURAL ELECTRIC LINES—Warren Rural Electric Co-operative, Warren, 131 mi. rural electric lines, Warren and Erie Counties, Project Pennsylvania 1019 B1 Warren; $135,000. Gibbs & Hill, Inc., 600 N. 2 St., Harrisburg, engrs. CD 8/12—ENR 8/21.

Bids Asked October 8

†**Idaho** — STRUCTURAL STEEL — Bureau Reclamation, Customhouse, Denver, Colo., furnishing structural steel for Payette River Bridge on relocation Idaho Northern branch Oregon Short Line R.R., Cascade Reservoir, Boise Project, Spec. 1555-D.

B. C., Port Hardy—AIRPORT—Secy. Dpt. Transport, Ottawa, Ont., airport development, clearing, stumping, grubbing, etc. About $175,000.

Bids Asked October 14

Pennsylvania—RURAL ELECTRIC LINES—Claverack Electric Co-operative Inc., Bradford, 210 mi. rural electric lines, Bradford, Lycoming, Wyoming and Susquehanna Counties, Project Pennsylvania 15 Bradford, REA. Gibbs & Hill, Inc., 600 N. 2 St., Harrisburg, engrs. CD 8/7—ENR 8/21.

Bids Asked October 16

Pennsylvania—RURAL ELECTRIC LINES—Central Rural Electric Co-operative Assn., Inc., Clearfield, 119.55 mi. rural electric lines, Clearfield, Cambria and Jefferson Counties, Project Pennsylvania 14 Cl, Clearfield. REA. Gibbs & Hill, Inc., 600 N. 2 St., Harrisburg, engrs. CD 8/7—ENR 8/21.

Bids Asked October 17

★†**Arizona-California** — TRANSMISSION LINES — Bureau Reclamation, Producer Bldg., Phoenix, Ariz., 123.5 mi. transmission line from Phoenix to Tucson, etc., Parker Dam Power Project, Spec. 993. $700,000.

Bids Asked October 20

†**Washington** — OIL CIRCUIT BREAKERS, etc.—Bureau Reclamation, Customhouse, Denver, Colo., furnishing, del. 12 oil circuit breakers, 31 switches, lightning arresters, for Grand Coulee power plant, Columbia River Basin Project, Spec. 994.

LOW BIDDERS

Calif., Marysville—AIRPORT—U. S. Eng., 208 Post Office Bldg., Sacramento, Sept. 15, landing strip, runways, etc. municipal airport, Inv. 1105-42-17, from J. A. Casson, 22,105 Meekland Ave., Hayward, **$244,865.** Est. $206,307. CD 8/25—ENR 8/28.

†**Idaho, Boise**—AIR BASE FACILITIES—U. S. Eng., Pittock Blk., Portland, Sept. 16, Ore., ordnance storage facilities, Airbase, Inv. 698-42-116, from C. W. Watkins, Boise. **$130,036.** CD 8/26—ENR 8/28.

New York—RAILROAD DETOUR TRACK GRADING—Staten Island Rapid Transit Ry. Co., W. G. Curran, genl. mgr. 25 Bway, New York, Sept. 12, grading temporary detour track Grant City to Bay Terrace, Staten Island, from M. I. Klostergard, 83 Main St., Tottenville, **$38,950.**

★**N. Y., New York** — TUNNELS — At office New York City Tunnel Auth., A. Jones, chn., 200 Madison Ave., Sept. 16, Manhattan tunnels, Brooklyn-Battery Tunnel, from Mason & Hanger Co., Inc., 500 5 Ave. **$13,948,000** (unofficial). CD 9/3—ENR 9/11.

†**Oregon** — SAND and GRAVEL — Bureau Reclamation, Customhouse, Denver, Colo., Sept. 16, furnishing 10,000 tons sand and 26,000 tons gravel for North Unit main canal and 850 tons sand and 1,300 tons gravel for Cove power plant enlargement, Deschutes Project, from C. T. Lackey, Ontario. **$53,923.** CD 9/2—ENR 9/4.

†**Washington** — CONDUCTOR — Bonneville Power Admin., P. O. Box 3537, Portland, Ore., Sept. 11, furnishing conductor and accessories for Circuits 5 and 6, Bonneville Vancouver 115 kv. line, Inv. 2208, from Phelps Dodge Copper Products Corp., 40 Wall St., General Cable Corp., 420 Lexington Ave., and Anaconda Wire & Cable Corp., 25 Broadway, all New York, N. Y. (identical bids). **$48,674.** CD 8/29—ENR 9/4.

†**Wash., Longview** — CAPACITATORS — Bonneville Power Admin., P. O. Box 3537, Portland, Ore., Sept. 15, furnishing 8 capacitators for substation, Inv. 2220, from Westinghouse Electric & Mfg. Co., Porter Bldg., Portland, Ore., Cornell Dubilier Electric Corp., Hamilton Blvd., South Plainfield, N. J., and General Electric Co., 1 River Rd., Schenectady, N. Y. (identical bids). **$151,272.** CD 9/4.

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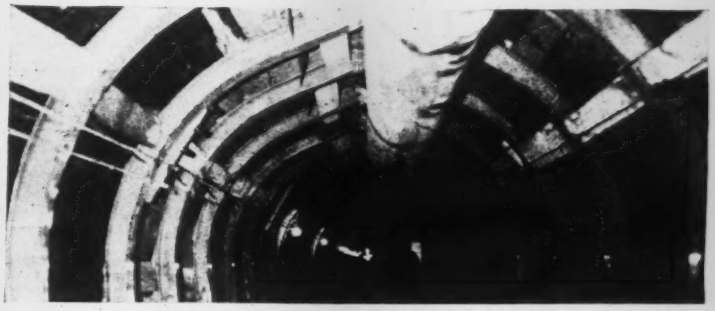

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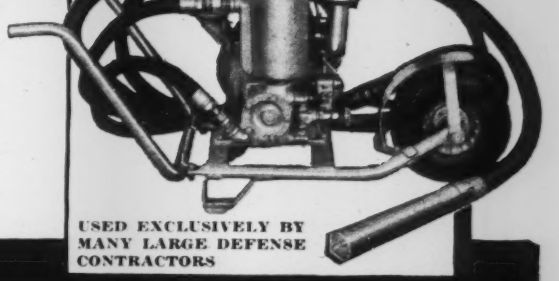

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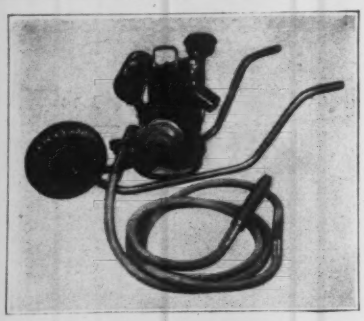

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UNCLASSIFIED (Continued)

CONTRACTS AWARDED

Calif., Mare Island—POWER LINE—Pacific Gas & Electric Co., 245 Market St., San Francisco, standby line from power lines at Carquinez Straits to Mare Island Navy Yard and Vallejo, own forces. **$300,000.**

Ia., Iowa City—RUNWAY—G. C. Watson, city clk., additional runway construction. **WPA. $52,053.**

†Me., Houlton — RUNWAY and TURNAROUND—U. S. Eng., Park Sq. Bldg., Boston Mass., runway exten. and turnaround, airport, Army Air Base, to J. R. Cianchette, 120 Main St., Pittsfield. **$134,622.**

†Me., Presque Isle — AIRPLANE TURNAROUND—U. S. Eng., Park Sq. Bldg., Boston, Mass., turnaround for planes, airport, Army Air Base, to C. J. Cianchette, 120 Main St., Pittsfield. **$54,137.**

†Md., Curtis Bay (Sta. Baltimore)—DOCK REPAIRS—Con. Q.M., dock repairs, to Empire Constr. Co., 31 S. Calvert St., Baltimore. **$34,000.**

Mass., Lynn—WHARF—General Electric Co., 920 Western Ave., pile, timber wharf, Saugus River, Riverworks Plant, to Seaboard Constr. Co., 201 Marginal St., Chelsea Approx. **50,000.**

Mass., South Boston (br. Boston)—COAL CONVEYOR—Boston Edison Co., 39 Boylston St., Boston, steel trestle, belt coal conveyor E. 1 St., to Wm. T. Donovan Co., 10 Post Office Sq., Boston. Approx. **$25,000.**

†N. H., Manchester—AIR BASE—U. S. Eng., Park Sq. Bldg., Boston, Mass., buildings, utilities, roads, Army Air Base, to Grande & Volpe, Inc., 54 Eastern Ave., Malden, Mass. **$185,674.** Bids 9/12. CD 9/17, under LB, Public Bldgs.

N. J., Jersey City—Pennsylvania R.R. Co., W. D. Wiggins, ch. engr., Broad St. Sta. Bldg., 1617 Pennsylvania Blvd., Phila., Pa., general alterations, imprv. railroad terminal and ferry terminal, to James Mitchell Inc., 575 West Side Ave., Jersey City. **$50,000.** H. K. Smith, 921 Bergen Ave., engr.

N. J., Newark—PARK IMPROVEMENTS—Essex Co. Park Comn., 115 Clifton Ave., grading, landscaping parks. **WPA. $53,700.** R. D. Crater, 115 Clifton Ave., WPA and co. engr.

N. C., Goldsboro—AIRPORT—A. B. Sansbury, city mgr., complete airport. **WPA. $193,394.** T. W. Pate, WPA superv.

N. D., Fargo—HANGAR—Northwest Airlines, Inc., Fargo, hangar, to T. P. Powers Constr. Co., 217 4 Ave. N. Est. **$60,000.**

†Pennsylvania—PARK IMPROVEMENTS—Natl. Park Serv. Dpt. Interior, C St. between 18 and 19 Sts., N.W., Wash., D. C., developing additional units, etc., French Creek Recreational Demonstration area, incl. Hopewell Village, near Birdsboro. **WPA. $74,838.**

Pennsylvania — SPUR LINE RAILWAY — Baltimore & Ohio R.R., Charles and Baltimore Sts., Baltimore, Md., 8.3 mi. spur line railway connecting Somerset-Cambria Branch, near Shanksville, Stony Creek and Somerset Twps., own forces. **$25,000.** C. B. Harveson, c/o owner, engr. Maintenance and Ways. CD 9/10—ENR 9/18.

Pa., Midland—PETROLEUM TERMINAL—Socony Vacuum Oil Co., 230 Park Ave., New York, N. Y., marine petroleum products plant, own forces. Over **$25,000.** CD 8/26—ENR 8/28.

†R. I., Newport — PIER — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., pier, to Beattie Corp., 209 Bedford St., Fall River, Mass. **$200,000.** CD 6/10—ENR 6/19.

Tex., Vernon—AIR TRAINING SCHOOL—Ed Richey, c/o Richey Airport, Vernon, air training school bldgs., facilities, to W. A. Zant & J. L. Green, 1926 Patton Ct., Fort Worth. **$70,000.** R. P. Woltz, Jr., 810 Dan Waggoner Bldg., Fort Worth, archt. CD 7/10—ENR 7/17.

Tex., Victoria—PARK IMPROVEMENTS—270 acre municipal park imprvs., swimming pool, golf course, etc. **WPA. $110,930.** R. H. H. Hugman, c/o Morris Plan Bank Bldg., San Antonio, engr.

Tex., San Angelo—AIR TRAINING FIELD—Tom Green Co., c/o Judge, San Angelo, air corps pilots training center, grading, drainage, leveling field, water and sanitary sewer lines, 3 mi. southwest of here. **WPA. $57,090.**

†Tex., San Antonio—AIRPLANE REPAIR DOCK—U. S. Eng., Federal Bldg., Galveston, 1 story airplane repair dock, Duncan Field, to Quisle & Andrews, 3320 W. 7 St., Fort Worth, and Duncan Field, San Antonio. Est. **$300,000.**

★**†Virginia**—NAVAL BASE—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., imprv. Naval Operating Base and Fuel Annex on Craney Island, **WPA. $545,167.**

★**†Va., Portsmouth**—SHIPYARD — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., shipyard and shop repair facilities, St. Helena Coast Guard Station, near here, to Dry Dock Associates, 10 East 40 St., New York, N. Y. **$6,000,000.**

†Wash., Fort Lewis—FIELDHOUSE, etc.—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., fieldhouse, restrooms, baseball diamonds, football field, bleachers for 10,000 spectators, drainage, etc., **WPA.** $[illegible],000.

★**†Alaska, Bethel**—AIRPORT — [illegible] Aeronautics Auth., Commerce Bldg., Wash., D. C., grading, paving and building for airport, to Morrison-Knudsen Co., [illegible] Bway., Boise, Idaho. **$1,566,358.** CD 7/25—ENR 7/31.

Alta., Airdrie—HANGARS, etc.—[illegible] Dpt. Munitions & Supply, Ottawa, Ont., hangars, other bldgs., for Dpt. National Defense for, to Buchan Constr. Co., Ltd., 1306 11 Ave. W., Calgary. **$115,000.** Bids 8/21. CD 8/18.

Alta., Calgary—TUNNEL—Municipality, J. M. Miller, clk., rein.-con. tunnel, St. George's Island, to Buchan Constr. Co., Ltd., 1306 11 Ave. W. **$29,215.** Est. $30,000.

Alta., Grande Prairie—AIRPORT, etc.—Dpt. National Defense for Air, Ottawa, Ont., airport bldgs., hangars, etc., to Tuffnell, Beagle & Donald, Grande Prairie. About $166,000.

Alta, Granum—HANGARS—Dpt. National Defense for Air, Ottawa, Ont., hangars, various buildings, aerodrome, to Buchan Constr. Co., Ltd., Calgary. **$75,000.**

Alta., Innisfail — AERODROME — Dpt. National Defense for Air, Ottawa, Ont., relief intermediate aerodrome, hangar, living quarters, mess hall, garage, etc., to Bennett & White Const. Co. Ltd., 6 James Richardson Bldg., Edmonton. **$120,000.** Bids 8/19.

Alta., Shepard—HANGAR, etc.—Dpt. National Defense for Air, Ottawa, Ont., hangar, etc., Relief No. 1 to Calgary (Currie) to Assiniboia Eng. Co. Ltd., Lombard Bldg., Winnipeg, Man. **$70,000.**

Alta., Suffield—AERODROME—Dpt. Transport, Ottawa, Ont., aerodrome development, grading, drainage, constructing hard surface runway and taxi strip, Experimental Station for R.C.A.F., to Nebon River Constr. Co. Ltd., Winnipeg, Man., about **$232,000.**

Alta., Wainwright—COAL DOCK—J. W. Porter, ch. engr. (western region), Canadian National Rys., Winnipeg, Man., 300 ton mechanical coaling dock and sand pocket, to Pearson Bros. Ltd., 718 McIntyre Bldg., Winnipeg, Man., about **$150,000.** Bids 8/11. CD 8/1—ENR 8/7.

B. C., Prince George — AIRPORT—Dpt. Transport, Ottawa, Ont., airport buildings, hangar, staff buildings, etc., to Carter-Halls-Aldinger Co. Ltd., Royal Bank Bldg., Winnipeg, Man., about **$71,000.**

B. C., St. John—AERODROME—Secy. Dpt. Munitions & Supply, Ottawa, Ont., airways and transmitter bldgs., garage, residences, etc., Aerodrome, to Western Constr. & Lumber Co. Ltd., 7 Imperial Bank Bldg., Edmonton, Alta. **$73,105.**

★**†Greenland** — AIR BASE — U. S. Eng. Northern Atlantic Div., New York, N. Y., air base, Contr. DAW 1098 Eng 2, to McWilliams Dredging Co.-Nick F. Helmers, Inc., 15 Moore St., New York, N. Y. Est. **$20,000,000.**

Man., Petrel—HANGAR, etc.—Dpt. National Defense for Air, Ottawa, Ont., double hangar, other bldgs., Relief Intermediate aerodrome, to Clayton Co. Ltd., 253 St. Ames Rd., Winnipeg. **$130,000.** CD 8/25—ENR 8/28.

Man., Winnipeg—COAL DOCK, etc.—J. W. Porter, ch. engr. (western region), Canadian National Rys., Winnipeg, 300 ton mechanical coal dock and sand pocket, to Pearson Bros. Ltd., 718 McIntyre Bldg., Winnipeg., about **$150,000.** Bids 8/11. CD 8/1—ENR 8/7.

N. S., Bedford Basin—WHARF, etc.—Dpt. National Defense, Ottawa, Ont., wharf and shed, to E. G. M. Cape & Co. Ltd., 629 Cathcart St., Montreal, Que. **$200,000.**

N. S., Dartmouth — WHARF IMPROVEMENTS—Secy. Dpt. P. Wks., Ottawa, Ont., wharf imprvs., dredging, to J. P. Porter & Sons, Ltd., 1010 St. Catherine St. W., Montreal, Que., **$214,340.** Bids 8/4. CD 7/28—ENR 7/31.

N. S. Debert—DEPOT—Dpt. National Defense, Ottawa, Ont., additional bldgs., X Depot, to Tomlinson Constr. Co. Ltd., 21 King St. E., Toronto, Ont. **$200,000.** Bids 8/7. CD 8/5.

N. S., Halifax — BOATHOUSE — Dpt. National Defense for Sea, Ottawa, Ont., Boathouse 5, H. M. C. Dockyard, to Standard Constr. Co. Ltd., 101 Upper Water St., **$104,131.** C. D. Sutherland, c/o Dpt. P. Wks., Ottawa, Ont., archt.

N. S., Yarmouth—AERODROME, etc.—Dpt. National Defense for Air, Ottawa, Ont., aerodrome, living quarters, mess buildings, etc., R.C.A.F. station, to Tomlinson Constr. Co. Ltd., Yarmouth. **$70,000.**

Ont., Aylmer—FLYING SCHOOL—Dpt. National Defense for Air, Ottawa, fire hall garages, workshops, etc., S.F.T. School, to Timms Constr. Ltd., 294 Dundas St., London. About **$70,000.**

Ont., Fergus—RELOCATING RAILROAD—Canadian Pacific Ry., J. E. Armstrong, ch. engr., Windsor St., Montreal, Que., Elora Cataract Branch, relocating Elora Cataract Branch, Grand Valley, constructing bridge, to Rayner Constr. Ltd., 29 Commercial St., Leaside (Toronto) about **$100,000.**

UNCLASSIFIED (Contracts Awarded, Cont'd.)

Ont., Fingal—AERODROME — Dpt. Transport, Ottawa, aerodrome development, drainage, repairing runways, and taxi strips, to Ryan Contg. Co. Ltd., Windsor. **$37,000.**

Ont., Raith — COALING DOCK — W. R. Devenish, genl. mgr. Canadian National Rys., Winnipeg, Man., 100 ton mechanical coaling dock, to Pearson Bros. Ltd., 718 McIntyre Bldg., Winnipeg, Man., about **$50,000.** Bids 8/11. CD 7/29—ENR 7/31.

Que., Montreal—EQUIPMENT DEPOT—Dpt. National Defense for Air Ottawa, Ont., additional buildings, No. 12 Equipment Depot., to Douglas Bemner Constr. Co., Ltd., 2049 McGill College Ave., **$76,000.**

LATIN AMERICA

Brazil, Rio de Janeiro—Companhia Siderburgica Nacional (Brazilian Natl. Steel Co.), Rio De Janeiro, awarded contract constructing by-products coke plant, consisting 55 Becker type coke ovens and incl. plant for recovery ammonia, tar, benzol, toluol, etc., in connection with blast furnace and steel plant, Volta Redonda, to Koppers Co., Koppers Bldg., Pittsburgh, Pa. Est. $3,000,000.

Mexico—Scrita. de A. P., Mexico, D. F., plans general charities hospital, 500 beds, **Puebla,** Puebla, first of chain for capital of each of 28 Mexican states and 3 territories' capitals, $175,000***F. S. T. S. E., Lucerna, 32, Mexico, D. F., plans general hospital for members, **Mexico City,** Federal Dist. $415,000.

PUBLIC BUILDINGS

PROPOSED WORK

†**Ariz., Fort Huachuca**—Cochise Co., Bisbee, school and school addns., Docket Ariz. 2-102. $102,800. **DPW.**

†**Calif., Inglewood**—Inglewood City School Dist. of Los Angeles Co., school addns., Docket Calif. 4-138. $156,322. **DPW.**

†**Calif., Long Beach**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., rescinded contract 600 housing units. CD 8/7—ENR 8/14 under CA.

†**Calif., Salinas**—City, recreation center, Docket Calif. 4-180. $93,000. **DPW.**

★†**Calif., Vallejo**—Vallejo Unified School Dist., school and school addns., Docket Calif. 4-119. $2,368,260. **DPW.** CD 8/26—ENR 8/14.

†**Conn., Groton**—Town, school facilities, (Eastern Point Area), Docket Conn. 6-112. $220,000. **DPW.** CD 8/19—ENR 8/21.

†**Fla., Starke**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation center, Docket Fla. 8-130. $80,525. **DPW.**

†**Fla., West Palm Beach**—City and Palm Beach Co., recreation center, Docket Fla. 8-103. $4,666. **DPW.**

†**Ga., Hinesville**—Bd. Educ. Liberty Co., school facilities, Docket Ga. 9-111. $68,300. **DPW.**

†**Ga., Savannah**—Mayor and Bd. Aldermen, recreational facilities, Docket Ga. 9-134. $4,530. **DPW.**

†**Ill., Belleville** — City, recreation center, Docket Ill. 11-133. $91,985. **DPW.**

†**Ill., Highwood**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation center, Docket Ill. 11-159. $83,730. **DPW.**

†**Ill., Silvis**—School Dist. 34, Rock Island Co., school facilities, Docket Ill. 11-148. $16,000. **DPW.**

†**Ind., New Albany** — New Albany School Twp., Floyd Co., school addn., Docket Ind. 12-106. $58,700. **DPW.**

★**Ia., Des Moines**—State, Des Moines, bids about March, state office building. $1,428,000. Tinsley, McBroom & Higgins, 602 Hubbell Bldg., archts. CD 7/14—ENR 7/17.

Ia., Slater—City, P. Rood, clk. voted $65,000 bonds light plant. R. W. Gearhart, 349 21 St. S.E., Cedar Rapids, engr. CD 7/2—ENR 7/10.

★†**Kan., Kansas City**—Pub. Bldgs. Admin., c/o W. N. Collier, Post Office Bldg., Kansas City, Mo., plans by Harlan Bartholomew & Associates, 317 N. 11 St., St. Louis, Mo., approx. 350 dwelling units, 7 to 10 Sts. and Toswell Ave. to Missouri Pacific tracks. $1,250,000. CD 6/6—ENR 6/12.

†**Ky., Fort Knox**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation center, Docket Ky. 15-114. $75,000. **DPW.**

†**La., Leesville**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation center, Docket La. 16-125. $75,000. **DPW.**

†**Md., Laurel**—Mayor and City Council, recreation center, Docket Md. 18-111. $82,000. **DPW.**

Md., Towson—Comrs. Baltimore Co., Court House, 3 story hospital. $300,000.

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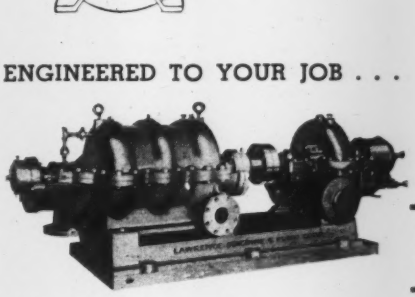

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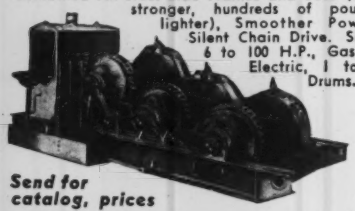

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

†**Mass., Ayer** — Town, high school addn., Docket Mass. 19-111. $54,000. **DPW.**

★†**Mass., Chicopee Falls**—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., 86 buildings, barracks, warehouses, chapels, recreation bldg., club, mess hall, officers quarters, etc., for 34th Bombardment Group and 1st Rtconnaissance Squadron 60th Transport Group and 26th Air Base Group, Westover Field. $2,250,000.

†**Mass., Hyannis**—Town of Barnstable, recreation center, Docket Mass. 19-112. $82,000. **DPW.**

†**Mass., Lynn**—Lynn Hospital, D. Traner, supt., 212 Boston St., bids soon 5 story, bsmnt., 45x130 ft., brick, steel, stone, concrete hospital addn., Boston St. **$350,000.** Stevens, Curtin, Mason & Riley, 45 Newbury St., Boston, archts. CD 7/28—ENR 7/31.

†**Mass., Springfield**—United States Housing Auth., F St. between 18 and 19 Sts. N.W., Wash., D. C., 300 defense housing units.

†**Mich., Ann Arbor**—International Industries, Inc., Ann Arbor, plant for manufacture ordnance equip. for War Dpt. $55,900 for land and building. Defense Plant Corp. will finance.

†**Mich., Battle Creek** — City, 2 recreation centers, Docket Mich. 20-126. $150,000. **DPW.**

†**Mich., Warren Twp.**—School Dist. 2, Warren Twp., Macomb Co., temporary school, Docket Mich. 20-123. **$83,400. DPW.**

Miss., Bonneville — Northeast Mississippi Junior College Dist., school administration building. $230,000.

†**Miss., Moss Point**—Municipal Separate School Dist. of Moss Point, school, Docket Miss. 22-103. $30,000. **DPW.**

†**Miss., Pascagoula**—Pascagoula Rural Separate School Dist., high school addn. and alterations, Docket Miss. 22-106, $57,012; school, Docket Miss. 22-107, $145,066; school shop addn., Docket Miss. 22-113, $19,918; school and school alteration, Docket Miss. 22-114, $47,862. **DPW.** CD 7/16—ENR 7/24.

†**Mo., Jefferson Barracks (Br. St. Louis)**—U. S. Eng., 816 U. S. Court House & Custom House, St. Louis, bids soon 1 story, 16x19 ft. gasoline service station, two 5,000 gal. underground tanks, 2 pumps, etc.

†**Mo., Lebanon**—State Bd. Health, Jefferson City, public health and clinic center, Docket Mo. 23-120, $26,250. **DPW.**

†**Mo., Newburg**—Con. Q.M., Fort Leonard Wood, reconstructing theatre, destroyed by fire.

†**Mo., Rolla**—City, recreation center, Docket Mo. 23-104. $45,000. **DPW.**

†**Mo., Waynesville**—Consolidated School Dist. 6, Pulaski Co., new school bldgs., Docket Mo. 23-106. $252,812. **DPW.**

†**N. J., Camden**—Penn.-Jersey Shipbuilding Corp., Camden, plant for Maritime Comn. $190,000 for land, buildings and facilities, $125,000 for machinery and equip. Defense Plant Corp. will finance.

†**N. Y., Buffalo**—Buffalo Housing Auth., 3,100 defense housing units for USHA.

†**N. Y., Ilion**—Ilion Hospital, hospital addns., alterations, Docket N.Y. 30-108. $159,748. **DPW.**

N. C., Fayetteville—J. S. McFayden, mayor, abattoir. $60,000. Applied for DPW funds.

★**N. C., Wilmington**—Bd. Comrs. New Hanover Co., Wilmington, constructing, imprv. schools in county. $867,023. Applied for DPW funds. A Hewlett, Sr., chn. Bd. CD 7/29—ENR 7/31.

★**N. C., Wilmington**—Imprv. James Walker Memorial Hospital. $1,316,759. Seeking FWA funds.

†**O., Massillon**—Pub. Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., rejected bids Sept. 2, 300 defense housing units for industrial workers in Massillon-Canton area. CD 9/4—ENR 9/11, under LB.

O., Upper Arlington—$177,000 bond election Nov. 4, 12 classroom Barrington Road School addn., for Bd. Educ., J. W. Jones, supt.

†**O., Warren** — American Welding & Mfg. Co., Warren, plant for manufacture tank parts, for War Dpt.; $14,500 for land and buildings, $342,500 for machinery and equip. Defense Plant Corp. will finance.

†**Pa., Lebannon**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation bldg. and equip., Docket Pa. 36-132. $82,132. **DPW.**

Pa., Lock Haven—Lock Haven School Dist., J. F. Puderbaugh, supt., vocational school on 250x300 ft. site. Over $150,000.

†**Pa., Phila.**—Pub. Bldgs., Admin., 9 and D Sts. S.W., Wash., D. C., 200 defense housing units, Phila. area (Bristol).

Pa., Polk—Commonwealth of Pennsylvania, State Auth. Bd., D. Diehl, dir., Harrisburg, utility services, exten. steam, water and electric lines, for new boys infirmary bldg., Polk State School. $100,000. R. H. Craig, 222 N. 3 St., Harrisburg, engr.

†**Pa., York**—National Youth Ad[illegible] and New York Ave., Wash., D. [illegible] steel, glass machine shop, Girard Ave. and East Maple St. $75,000 incl. equi[illegible]

R. I., Newport—W. MacLeod [illegible] Building Comn., 165 Thames St., [illegible] bsmnt., brick, steel school, Sumn[illegible] St. and Malbone Rd. $200,000.

★†**S. C., Charleston** — School Dist. 4 of Charleston Co., school facili[illegible] Docket S.C. 38-109, $415,153; school facilities, Docket S.C. 38-110, $429,000. **DPW.**

Tex., Austin—Austin State Scho[illegible] Austin, plans by Page, Sutherland & Page, Endell Gracy Bldg., school $275,000; building imprvs., etc. $150,000. E. V. Manning, Austin, engr.

Tex., Bastrop—W. Rogers, mayor, plans by L. Southerland, Nalle Bldg., Austin, city hall, fire and police station. $150,000. Applied for DPW funds.

Tex., Big Spring—Big Spring State Hospital, plans by L. H. Gaskins, 123 Allen St., San Antonio, 3 ward hospital bldgs., tunnels, utility, connections, etc. $443,150. Funds appropriated by Legislature. F. T. Drought, 503 Frost Bank Bldg., San Antonio, engrs. CD 9/15—ENR 9/18.

†**Tex., Brownwood**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation bldg. and equip., Docket Tex. 41-123. $69,540. **DPW.**

Tex., Canyon—West Texas State Teachers College, Canyon, plans by M. O. Garder, 31 Fisk Bldg., Amarillo, 2 story, brick, stone science bldg. $175,000.

Tex., Corpus Christi — Sunshine-Aberdeen Consolidated School Dist. 5, plans by Brock, Robert & Anderson, c/o Jones Bldg., brick, concrete school (Tex. 41-131). $385,000. Applied for DPW funds. CD 7/30—ENR 8/7.

Tex., Galveston — Island Common School Dist., c/o A. G. Hablnetzel, plans by B. Milam, c/o U. S. Natl. Bank Bldg., brick, concrete school, gymnasium, etc. $175,000. Applied for DPW funds.

Tex., Gatesville—Gatesville State School for Boys, Gatesville, plans by M. Peterman, 707 Liberty St., Dallas, school imprvs., dormitory, hall, etc. $150,000.

Tex., Henrietta—Midway School Dist. 1, J. W. Calloway, supt., plans by Voelcker & Dixon, 913½ Indiana Ave., Wichita Falls, 1½ story, 130x322 ft. high school. $150,000.

Tex., Hitchcock—Hitchcock Common School Dist. 6, school. $175,000. Applied for DPW funds Jones & Tabor, c/o Union Nat. Bldg., Houston, archt. CD 3/31—ENR 4/3.

†**Tex., Houston**—Houston Housing Auth., 150 defense housing units for USHA.

★†**Tex., Longview** — Reconstruction Finance Corp., 1825 H St. N.W., Wash., D. C., iron ore smelting plant, incl. steel mill. $40,000,000.

Tex., Lubbock—Bd. Educ., J. T. Hutchinson, plans by Haynes & Strange, Myrick Bldg., school. $185,000. Applied for DPW funds.

Tex., Lubbock—Bd. Educ., c/o J. T. Hutchinson, plans by Haynes & Strange, Myrick Bldg., 1 story school. $200,000.

Tex., Midland—Bd. Educ., plans by W. C. Hedrick, 1005 1st Natl. Bank Bldg., Fort Worth, 1 story school, $150,000; Junior High and High School, $187,563; Elementary School $2,150,000. Applied for DPW funds. CD 7/21—ENR 7/24.

Tex., Mission — Mission Ind. School Dist., plans by B. Cocke, c/o Maverick Bldg., San Antonio, school. $151,000. Applied for PWA gr.

Tex., San Antonio — Edgewood Common School Dist. 41, Bexar Co., plans by Phelps & DeWees & Simmons, c/o Majestic Bldg., public school and shop, Tex. 41-296. $175,000. Applied for DPW funds.

★**Tex., San Antonio**—San Antonio Housing Auth., c/o Alamo Natl. Bank Bldg., expansion Alazan Courts housing. $1,200,000. Filing application with USHA.

Tex., San Antonio — C. K. Quin, mayor, plans by Spillman & Spillman, 402 Hicks Bldg., military police headquarters, barracks, garages, etc., 510 S. Main St. $194,450. Applied for DPW funds.

Tex., San Marcos—Southwest Texas State Teachers College, c/o C. E. Evans, pres., San Marcos, plans by H. P. Smith, c/o Natl. Bank Commerce Bldg., San Antonio, brick, concrete college. $150,000.

Tex., Velasco—Velasco Ind. School Dist., c/o P. Carruthers, supt., plans by Hedrick & Lindsley, 818 Southern Standard Bldg., Houston, brick, hollow tile school and junior high school, Tex. 41-319. $156,853. Applied for DPW funds. CD 5/21—ENR 5/29.

†**Tex., Ysleta**—City, school facilities, Docket Tex. 41-148. $38,000. **DPW.**

Utah, Springville—$300,000 bond election Oct. 3, municipal hydro-electric plant. H. Price, Provo, engr.

PUBLIC BLDGS. (Proposed Work, Cont.)

★**Va., Alexandria**—Louisa Co., V. B. Connelly, pres., 2 story, brick, steel, concrete, recreation center, shopping center, bowling alleys, theatre, shops and office space. $500,000.

†**Va., Denbigh**—Warwick County School Bd., school and addns., Docket Va. 44-157. $250,000. **DPW.**

†**Va., Hampton**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation center, Docket Va. 44-137. $50,000. **DPW.**

†**Va., Newport News** — School Bd., high school addn., Docket Va. 44-126. $119,000; elementary and junior high school, Docket Va. 44-128. $341,050. **DPW.**

★†**Va., Norfolk**—City School Bd., school facilities, Docket Va. 44-104. $783,947. **DPW.**

†**Va., Quantico**—Defense Housing Div. FWA, 7 and D Sts. S.W., Wash., D. C., 250 demountable defense housing units.

†**Va., Radford**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation center, Docket Va. 44-151. $115,000. **DPW.**

†**Wash., Bremerton** — City, fire stations, addns., equip. and alarm sys., Docket Wash. 45-125. $283,450. **DPW.** C. C. Casad, City Hall, P. Wks. Comr.

★†**Wash., Bremerton**—Consolidated School Dist. 100-C, Kitsap Co., new schools, alterations, addns., Docket Wash. 45-111. $2,330,000. **DPW.** CD 1/15—ENR 1/23.

★**Wash., Seattle**—Seattle Housing Auth., Central Bldg., 1500 addnl. housing units for defense workers, $6,000,000.

†**Wash., Seattle**—Defense Housing Div. FWA, (West Coast Office), 1,500 defense housing units.

†**W. Va., Morgantown**—Pub. Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., 150 defense housing units.

★**Wis., Manitowoc**—Manitowoc Co., revised plans by Stubenrauch, Brandt & Schmitt, Court House, 3 story, bsmnt. asylum bldg. $500,000. Bids 9/6 rejected. CD 9/11—ENR 9/18 under LB.

Wis., Sheboygan—Sheboygan Co., 1 story, 100x300 ft., hy. shop and garage bldg. A. C. Droppers, c/o owner, engr.

Alta., Calgary—Secy. Dpt. P. Wks., Ottawa, Ont., bids soon brick hospital for Canadian Red Cross. $375,000. C. D. Sutherland, c/o owner, archt.

B. C. Esquimalt—Wartime Housing Ltd., 55 York St., Toronto, Ont., bids soon 50 demountable dwellings. $150,000-$200,000.

★**Que., St. Malo**—Secy. Dpt. Munitions & Supply, Ottawa, Ont., soon lets contract 1 story, 457x560 ft., rein.-con. cartridge plant, for Dpt. National Defense, Ottawa, Ont. $1,000,000.

Que., Shelter Cove—Reverend Sisters of Charity, Shelter Cove, convent. $150,000.

Sask., Saskatoon—Secy. Dpt. Munitions & Supply, Ottawa, Ont., barracks, etc., for Flying Training School, Bedford Rd. Collegiate Institute, for Dpt. National Defense for Air. $300,000.

BIDS ASKED

Bids Asked September 30

Idaho, Moscow—State Dpt. P. Wks., Boise, dairy bldg., University of Idaho, $95,000. Extended date. CD 8/28—ENR 9/4.

†**Maine** and **New Hampshire**—U. S. Eng., Park Sq. Bldg., Boston, Mass., post headquarters, motor repair shop, etc. for Air Corps Stations, Bangor, Me. and Manchester, N. H.

†**Me., Bangor**—U. S. Eng., Park Sq. Bldg., Boston, Mass., Post Headquarters Bldg., PH-14, Storehouse CWS SH-8 and Recreation Bldg. RB-1 addn.

†**N. H., Manchester**—U. S. Eng., Park Sq. Bldg., Boston, Mass., motor repair shop, oil storage houses, storehouse, recreation building addn., etc.

†**O., Cleveland**—National Advisory Com. for Aeronautics, E. R. Sharp, constr. administrator, Langley Field, Hampton, Va., brick, steel heating plant, Cleveland Airport. $450,000. CD 8/11—ENR 8/14.

†**Tex., Camp Wolters**—Con. Q.M., 2 barracks, mess, company administration and storehouse, administration bldg. A-5, for 156th Station Hospital; adv. ENR 9/25.

Bids Asked October 1

†**Ill., Savanna** — Con. Q.M., Savanna Ordnance Depot, Proving Ground, miscellaneous bldgs., 3 gates houses, carpenter shop, paint shop, lubricating oil storage building; adv. ENR 9/25.

†**Md., Baltimore**—Koppers Co., American Hammered Piston Ring Div., Bush and Hamburg Sts., manufacturing plant alterations and addns., 1 story, 60x190 ft. factory, 1 story, 45x100 ft. laboratory. Defense Plant Corp. will finance. CD 8/14—ENR 8/21.

Bids Asked October 3

Idaho, Twin Falls — Twin Falls Housing Auth., 1530 Poplar Ave., D. J. Wakem, dir., 56 unit housing project 1-1. $180,000. F. H.

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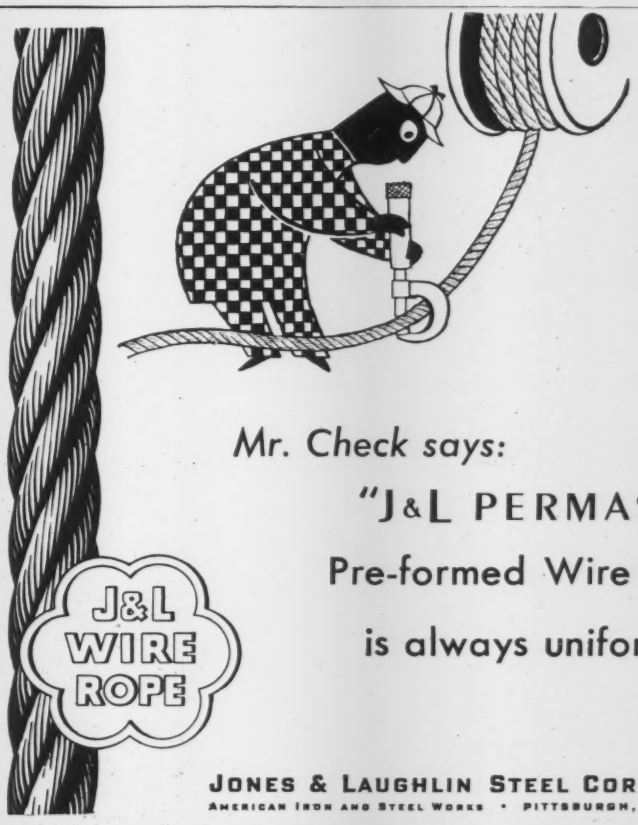

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PUB BLDGS. (Bids Asked, Cont'd.)

Paradice, Jr., and H. G. Lash, Fidelity National Bank Bldg., archts. Extended date. CD 8/29—ENR 8/21.

N. Y., New York—Dpt. P. Wks., Municipal Bldg., Contr. 1, excav. and footings, Contr. 2; structural steel; Contr. 3, concrete floor and roof archts, Nightingale Hospital, 163 St. between Riverside Dr. and Fort Washington Ave. CD 3/4—ENR 3/6.

Bids Asked October 7

Ariz., Tucson—Bd. Trustees School Dist. 1, F. W. Fickett, pres., Catalina Jr. High School addns., $150,000. M. H. Starkweather, 40 W. Congress St., archt. CD 5/22—ENR 5/29.

Mass., Lynn—Stevens, Curtin, Mason & Riley, archts., 45 Newbury St., Boston, 5 story, 45 x 130 ft., brick, steel, stone hospital addn., for Lynn Hospital, D. Traner, 212 Boston St. $350,000. CD 9/19—ENR 9/25.

S. C., Aiken—Aiken Housing Auth., 80 unit, Valley Homes Housing; Stoney Homes. Housing SC 7-2, $150,000. Bids 9/3 rejected. CD 9/9—ENR 9/11.

Bids Asked About October 8

†**Ala., Mobile**—U. S. Eng., Federal Bldg., substructure for Ocean Terminal Development, Brookley Field.

†**Calif., Santa Ana**—U. S. Eng., 4792 Sepulveda Ave., San Bernardino, barracks, hangars, recreational bldgs., utilities, West Coast Replacement Center, Army Air Corp., new Post Blvd. between Santa Ana and Costa Mesa. CD 7/31—ENR 8/7.

Bids Asked October 14

Pa., Pennhurst (P. O. Spring City)—General State Auth., 2 and Locust Sts., Harrisburg, male and female ward bldgs., etc., Pennhurst State School.

Bids Asked October 29

N. Y., Deer Park—State Dpt. Mental Hygiene, Albany, Kitchen and Dining Building 5, State Hospital. $150,000. W. Haugaard, comr. Architecture, archt., A. W. Brandt, supt. P. Wks., both State Office Bldg., Albany.

Bids Asked About November 10

Wis., Madison—Madison General Hospital, E. J. B. Schubring, pres. hospital assn., hospital addn. and remodeling. $350,000. Law, Law & Potter, 1 S. Pickney St., Madison, archts. CD 7/23—ENR 7/31.

Bids Asked November 13

★**N. Y., Central Islip**—Comr. Mental Hygiene, State Office Bldg., Albany, infirmary, Bldg. 95, Central Islip State Hospital. Approx. $1,000,000. CD 2/13/40—ENR 2/15/40.

Bids Asked November 13

N. Y., Deer Park—Comr. Mental Hygiene, State Office Bldg., Albany, Medical and Non-Medical Staff Bldg. 55, New State Hospital, near here. Approx. $175,000.

LOW BIDDERS

★**Calif., Sacramento** — Sacramento Housing Auth., 115 City Hall, Sept. 16, 170 unit Dos Rios housing, Cal. 7-1, from Campbell Constr. Co., 800 R St., **$404,796.** Est. $560,000. CD 8/25—ENR 8/28.

†**Calif., Stockton**—Con. Q.M., Fort Mason, Sept. 12, 4th Echelon Base Motor Repair Shop, Inv. 6616-42-14, from Meyer Constr. Co., 725 Portola Dr., San Francisco. **$333,663.** CD 9/3.

★†**Md., Baltimore**—Baltimore Housing Auth., 709 E. Eager St., Sept. 11, 200 defense housing units for USHA, No. 18098-X, from Woodcrest Constr. Co., Inc., and Rosoff Bros., Inc., 340 E. 38 St., New York, N. Y., **$623,333.** CD 9/3.

†**Mo., Robertson**—McDonnell Aircraft Corp., J. S. McDonnell, pres., Lambert-St. Louis Municipal Airport, Bridgeton, Sept. 16, 1 and 2 story, 175x250 ft., brick, steel airplane plant addition for manufacture tail surfaces and other airplane parts, for War Dpt., from McCarthy Bros. Constr. Co., Roosevelt Bldg., 4903 Delmar St., St. Louis. **$347,700.** CD 9/8.

★†**N. J., Bellmawr**—Mutual Ownership Defense Housing Div. FWA, 7 and D Sts., Wash., D.C., Sept. 15, one hundred seventy-five 1 and 2 story frame homes, from A. J. Paretta Contg. Co., 43-45 St., Long Island City, N. Y., **$2,023,000.** CD 9/3.

N. Y., Brooklyn—Bd. Educ., 110 Livingston St., Sept. 17, plumbing P.S. 35 addn., from Endres Plumbing Corp., 31-65 29 St., Long Island City, **$49,000*****heating, from Almirall & Co., Inc., 53 Park Pl., New York, **$111,328***** electrical work, from Bank Electrical Co., 126 W. 32 St., New York, **$59,900.** CD 9/8—ENR 9/11.

★**N. Y., Brooklyn**—Bd. Educ., 110 Livingston St., Sept. 19, general contract P.S. 35 addn., Lewis Ave., McDonough and Decatur Sts., from Caristo Const. Corp., 26 Court St. **$646,560.** CD 9/8—ENR 9/11.

N. Y., New York—Dpt. P. Wks., Municipal Bldg., Sept. 16, general contract Lincoln Hospital addn., Bronx Boro, from Lane Engineering Corp., 103 Park Ave., **$286,956***** plumbing, from Thos. E. O'Brien Co. Inc., 6311 5 Ave., Brooklyn, **$41,265*****heating, from Almirall & Co., 53 Park Pl., **$37,122*****electrical work, from Martin Epstein Co. Inc., 955 Lafayette Ave., Brooklyn, **$33,000.** CD 8/28—ENR 9/4.

†**N. C., Camp Davis**—Con. Q.M., [illegible] 16, 2 cantonment type bldgs., oil [illegible] and wash racks, from F. N. Th[illegible] Brevard St., Charlotte, **$91,800.** CD [illegible] 4—ENR 9/11.

†**O., Mariemont** — U. S. Eng., [illegible] Bldg., Cincinnati, Sept. 5, 1 story, [illegible] testing laboratory, Westover section, Mariemont, from William Leuvelink & Son, 3995 Woodford Rd., Cincinnati, [illegible] ternate **$72,931.** CD 8/23—ENR [illegible]

Tex., Beaumont—Lamar College, [illegible] Coombs, judge, Sept. 15, 1 story, [illegible] brick, concrete, stone auditorium, [illegible] Grimsbaw & Co., Box 1308, **$232,000.** Est. $250,000. W. B. Livesay, Annex [illegible] Bldg., archt. Stone & Pitts, Goodhue Bldg., assoc. archts.

★†**Tex., San Antonio**—U. S. Eng., Federal Bldg., Galveston, Sept. 15, hospitalization and medical service buildings, Kelly Field, from H. H. Moeller, 1211 North Willow St., **$656,417.** CD 8/21—ENR 8/28.

CONTRACTS AWARDED

†**Calif., Angel Island**—Con. Q.M., Fort McDowell, 13 troop buildings, Fort McDowell, San Francisco Bay (Angel Island), to Army Post Contractors, Inc., 1501 Maritime St., Oakland. **$472,000.**

†**Calif., Vallejo**—Div. Defense Housing, FWA, 7 and D Sts. S.W., Wash., D. C., community bldg. and school group in connection with defense housing near here, Calif. 4086, from Midstate Constr. Co., Pacific Southwest Bldg., Fresno, **$159,777.** Franklin & Kump, Jr., 7 W. Patterson Bldg., Fresno, archts.

†**Fla., Pensacola**—Pensacola Housing Auth., 200 defense housing units, Naval Air Station and Ellyson Field, Project 8084X and 8085X, for USHA, to Dyson Co., Pensacola, **$571,874.** CD 7/29 and 7/10—ENR 7/31 and 7/17.

★**Ill., Quincy**—Quincy Housing Auth., H. E. Wisherd, clk., Stern Bldg., 200 dwelling units, Ill. 16-1, and 49 dwelling units, Ill. 16-2, to T. S. Willis, 326 Hayes Blk., Janesville, Wis. **$882,290.** Bids 9/4, awarded 9/18 CD 9/17, under LB—ENR 8/14.

†**Ind., Fort Wayne**—Fort Wayne Housing Auth., 75 defense housing units, Project 12071X, for USHA, to Max Irmscher & Sons, Inc., 1113 Old First Bank Bldg. **$293,676.**

La., Lake Charles—Lake Charles Housing Auth., general contract 72 dwellings, Booker T. Washington Courts, to T. Miller & Sons, Lake Charles, **$238,397;** 73 dwellings High School Park Homes, to R. Angelle, Breaux Bridge, **$225,556.** Bids 8/21. CD 8/27—ENR 9/4 under LB.

★†**La., Leesville**—Pub. Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., 175 defense housing units, Camp Polk, to Salley & Ellis, 511 Ouachita Bank Bldg., Monroe, **$520,539.** Bids 8/15. CD 8/19—ENR 8/28.

†**Md., Cabin John**—U.S.H.A. North Interior Bldg., Wash., D. C., 2 defense housing, Navy civilian workers, 100 dwellings in Cabin John and 20 homes for negro families on Seven Locks Rd., about 1½ mi. north from Cabin John, to C. B. Ross Co., Inc., 20 Lafayette St., New York, N. Y., **$458,286.** CD 8/29.

†**Md., Fort George G. Meade**—Con. Q.M., recreation center addns., to Joseph Light Constr. Co., 1436 Kennedy St., N.W., Wash., D. C. **$274,987.**

†**Md., Fort George G. Meade**—Con. Q.M., recreation building, motor repair shop, 4 post exchanges, field house, etc., to Bass Eng. & Constr. Co., 2832 E. Grand Blvd., Detroit, Mich. **$191,150.** CD 8/14.

★†**Mass., South Boston (Sta. Boston)** — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., steel, concrete industrial units, 2 bldgs., incl. services, cranes, etc., to Morton C. Tuttle Co., 362 Park Sq. Bldg., Boston, **$1,500,000.**

★†**Mich., Detroit**—Detroit Housing Auth., 200 defense housing, Mich. 20042-X, Nevada and Fenelon Aves., for USHA, to The Christman Co., 408 Kalamazoo Plaza, Lansing, **$849,900.** CD 8/8—ENR 8/14.

★†**N. J., Clifton**—Pub. Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., 150 defense housing, Valley Rd., to James Mitchell, Inc., 575 West Side Ave., Jersey City. **$500,000.** CD 8/20—ENR 8/28.

†**N. J., East Paterson**—Pub. Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., 100 defense homes, Market St., to E. M. Johnson, 766 Bergen Ave., Jersey City. **$350,000.** CD 8/26—ENR 8/28.

†**O., Cleveland**—National Advisory Com. for Aeronautics, E. R. Sharp, constr. administrator, Langeley Field, Hampton, Va., 1 story, 210x232 ft. technical service bldg., to Schirmer-Schneider Co., 2719 Detroit Ave. **$488,200.** Bids 8/1, awarded 9/15. CD 8/12—ENR 8/14 under LB.

★†**Okla., Choteau**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., awarded contract engineering and architectural services, construction, acquisition and installing equipment, option for training key personnel and operating Oklahoma Ordnance Works, to E. I. du Pont de Nemours & Co., Du Pont Bldg., Wilmington, Del. Total contract $84,235,594. Construction will cost **$15,982,478;** equipment **$14,023,800.** CD 8/5—ENR 8/7.

★**Pa., Phila.**—General State Auth., 122 N. 2 St., Harrisburg, general contract workers bldg., Philadelphia State (Byberry) Hos-

PUBLIC BLDGS. (Contracts Awarded, Cont'd. pital, to R. S. Herzog, 1505 Race St., **$505,864** ***heating, ventilating, to L. F. Steadle, 247 Butler St., Kingston, **$56,554*****plumbing, to Daniel J. Keating Co., 513 S. 24 St., **$93,300***** electrical work to Keystone Eng. Corp., 1813 Callowhill St., **$31,500.** Grand total $687,218. Bids 9/11. CD 9/16—ENR 9/18.

★†**Pa., Phila.**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 8 story, 273x403 ft. warehouse, Navy Yard, to Turner Constr. Co., 420 Lexington Ave., New York, N. Y. **$2,078,000.** Zantzinger & Borie, Architects Bldg., Phila., archts. CD 9/10—ENR 9/18.

★†**S. C., Parris Island**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 26 officers quarters at Charleston Navy Yard, to Skinner & Ruddock, 155 E. Bay St., Charleston, **$232,426;** 30 officers quarters, at Parris Island, to V. P. Loftis, Builders Bldg., Charlotte, N. C., $296,489. Bids 9/9, awarded 9/18. CD 9/11—ENR 9/18.

†**Tex., Camp Barkeley**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., supplemental contract Medical Replacement Center, to A. J. Rife Constr. Co., 2803 Maple Lawn Rd., Dallas, **$282,000.** Additional to CD 8/6—ENR 8/14, under CA.

†**Tex., Fort Bliss**—Con. Q.M., Biggs Field, 1 story, general storage bldgs. to H. T. Ponsford & Sons, 914 E Missouri St., El Paso, **$80,657.**

★†**Tex., Freeport**—Dow Chemical Co., Freeport, and Midland, Mich., metallic magnesium plant, to Austin Co., Stone & Webster Eng. Corp. and M. W. Kellogg Co., M & M Bldg., Houston. **$52,000,000.** Defense Plant Corp. will finance. CD 9/12—ENR 9/18.

★†**Tex., Texarkana**—Lone Star Defense Corp., c/o B. F. Goodrich Co., 500 S. Main St., Akron, O., supplemental contract expansion facilities, permanent type construction new shell loading plant, for War Dpt., to Winston Bros. Co., 1470 N.W. Bank Bldg., Minneapolis, Minn., C. F. Haglin Sons Co., 720 Natl. Bldg., Minneapolis, Minn., Missouri Valley Bridge & Iron Co., Leavenworth, Kan., Sollitt Constr. Co., South Bend, Ind., and Brown & Root, Inc., 4300 Calhoun Rd., Houston, **$3,500,000.** Additional to CD 8/1—ENR 8/7, under CA.

†**Utah, Fort Douglas**—Con. Q.M., garages, fence, remodeling buildings, exten. and relocating sewer, water, gas, telephone and power lines and constructing road around reservation reservoir. **WPA. $295,450.**

†**P. R., Carolina** — Puerto Rico Housing Auth., 197 low-cost housing, PR 312, to Ulpiano Casal, San Juan. **$315,000.**

†**P. R., San Juan**—Pub. Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., 50 additional defense housing units, to Hillyer & Lovan, 111 W. Ashley St., Jacksonville, Fla., **$244,000.**

Ont., Oshawa—Wartime Housing, Ltd., 55 York St., Toronto, 50 dwellings, to John Maguire Contg. Co., Ltd., 24 Birch Ave., Toronto, about **$150,000.** CD 5/14.

Ont., Ottawa—Secy. Dpt. P. Wks., Ottawa, Jackson Bldg. addn., Slater St., to Ross-Meagher Ltd., 7 Echo Dr. **$327,472.** Bids 9/12. CD 9/4.

Ont., Peterboro—Wartime Housing Ltd., 55 York St., Toronto, 70 additional houses, Parkhill Rd., to Eastwood Const. Co. Ltd., Dominion Bank Bldg., George St., about **$150,000.**

Ont., Toronto—Dpt. P. Wks., Ottawa, temporary postal building, Fleet and York Sts., to H. A. Wickett & Co. Ltd., 156 Front St. E. Est. **$200,000.** C. D. Sutherland, c/o owner, archt. CD 9/17.

COMMERCIAL BUILDINGS

PROPOSED WORK

★**Calif., Los Angeles**—California Hospital, R. E. Herman, supt., 1414 S. Hope St., plans by Walker & Eisen, 1100 Wright & Callender Bldg., 405 S. Hill St., 10 story, bsmnt., sub-bsmnt., rein.-con., brick, tile north wing hospital addn., 1414 S. Hope St. $500,000.

Calif., Napa—Victory Hospital plans being completed by D. E. Jaekle, 126 Post St., San Francisco, 2 rein.-con. wing addns. $150,000. C. J. Sly, 251 Kearny St., San Francisco, engr.

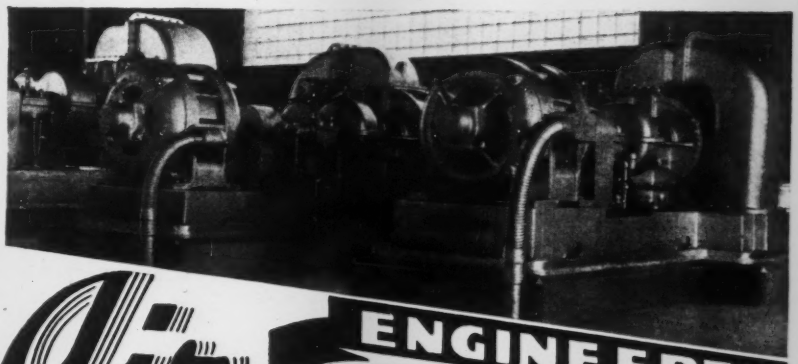
Conn., Hartford — B. Cox, chn. Hartford Housing Auth., 525 Main St., rejected bids Sept. 5, Nelton Court, USHA Conn. 3-1R. Will readvertise. C. J. Malmfeldt, 36 Pearl St., archt. CD 8/15—ENR 8/21.

Kan., Kansas City—Providence Hospital, 18 and Barnett Sts., plans by Carroll & Dean, R. A. Long Bldg., hospital addn. $300,000. CD 8/20—ENR 8/28.

Mass., Pittsfield—St. Mary's Roman Catholic Church, J. C. McMahon, pastor, plans nearing completion by J. R. Hampson, 30 Backman Ave., 2 story, bsmnt., brick, stone, church. $300,000. R. D. Kimball Co., 6 Beacon St., Boston, engrs.

N. Y., Brooklyn—Williamsburgh Savings Bank, 1 Hanson Pl., plans by A. L. Muller, 286 5 Ave., New York, altering, exten. 3 story bank, 151-75 Bway. $150,000.

N. Y., New York—Hillside Holding Corp., 750 Grand Concourse, plans by J. M. Felson, 250 W. 57 St., 6 story, apartment, Hillside and Nagle Aves. $300,000.



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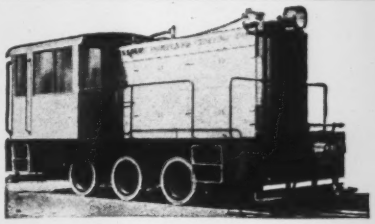

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COMMERCIAL BLDGS. (Proposed Work, Cont'd.)

N. Y., New York—Home & Hospital of Daughters of Jacob, 167 St. and Findlay Ave., plans by C. B. Meyers, 31 Union Sq., 6 story nurses home at site. $150,000.

N. Y., New York—Home of Old Israel, 280 Cherry St., plans by H. Hurwit, 213 W. 70 St., altering 8 story hospital. $150,000.

N. C., Charlotte—Charlotte Country & Day School, Dr. Thos. Burton, headmaster, 401 E. Morehead St., buildings, 90 acre site, off Sharon Rd. $200,000.

O., Canton—Canton Y.W.C.A., 420 Market St., plans by C. Firestone, archt., 1412 Cleveland Ave., 3 story, 60x200 ft., steel, rein.-con. club house. $250,000.

★**O., Cleveland**—A. W. Hebebrand, Inc., 18900 Lorain Rd., 100 houses, west side. $600,000.

O., Cleveland — Franciscan Sisters of St. Joseph, Marymount Academy, Mother Superior Josephat, 12215 Granger Rd., plans by F. C. Warner, Bulkley Bldg., 4 story, brick, steel, concrete hospital. $300,000.

O., Euclid—Anton Mavec, builder, 17110 Lake Shore Blvd., Cleveland, thirty 26x26 ft., brick, frame homes. $210,000.

O., Youngstown—St. Elizabeth Hospital Assn., hospital wing. $250,000-$300,000. Federal assistance sought.

Pa., Harrison Twp (mail Natrona Heights)—Laurence E. Lewis, Lawis Development, 307 Arrott Bldg., Pittsburgh, completed plans fifty 1½ and 2 story, basmnt., residences, $245,000.

S. C., Greenville—B. M. Craine, Franklin Natl. Life Bldg., soon lets contract 4 story, bsmnt. store, 12 N. Main St. $150,000. J. C. Penney Co., lessee.

Tex., Corpus Christi—Y.M.C.A., soon lets contract, 2 to 3 story, YMCA building, large gymnasium, concrete swimming pool, etc. $250,000. O. F. Johnson, c/o Amusu Bldg., 915 Bayview St., archt. F. T. Drought, c/o Frost Bldg., San Antonio, engr. CD 7/10—ENR 7/17.

Tex., Houston—YMCA, 918 Fannin St., negro YMCA bldg. $185,000.

Tex., Victoria — Victoria Development Co., c/o M. Leveridge, 210 Victoria Bank & Trust Co. Bldg., plans by E. F. Albaugh, 210 E. Mulberry St., San Antonio, 2 dwelling units for total 70 houses. $200,000.

Va., Fredericksburg — Mary Washington Hospital, enlarging hospital. $200,000.

Que., Quebec—Roman Catholic Diocese of Quebec, bids soon church, intersection St. Margaret and St. Roch Sts. about $300,000.

CONTRACTS AWARDED

Calif., Avenal — Avenal Theatre, Avenal, rein.-con. theatre, office and store, to D. Palmer, P.O. Box 546, Santa Cruz. **$150,000.** O. A. Deichmann, 1026 Market St., San Francisco, archt.

★**Calif., Calabasas** — Motion Picture Relief Fund of America, Inc., 6902 Santa Monica Blvd., Los Angeles (1st unit) rein.-con., steel home for aged actors, administration bldg., etc., near here, to Joshua H. Marks-Charde Co., 816 W. 5 St., Los Angeles. Approx. **$500,000.** CD 7/21—ENR 7/24.

Calif., Millbrae Highlands—J. M. Johnson, 220 Hazle Ave., 1 story residences, garages, day labor. Total expenditure over **$150,000.**

Calif., San Francisco—A. J. Kronquist, 919 Fell St., 1 story, bsmnt., wood frame residences, vicinity Newberg and Duncan Sts., day labor. **$150,000** or more.

Calif., Vallejo—Bay Dist. Investment Co., Financial Center Bldg., Oakland, 1 story, wood frame homes, vicinity Mare Island Navy Yard, day labor. Est. **$150,000.**

Calif., Vallejo—F. Honn, 176-19 Ave., San Francisco, 1 story, wood frame homes, vicinity Mare Island Navy Yard, day labor. Over **$150,000.**

Calif., Vallejo—R. O. Long, 1264 Arkansas St., 1 story, wood frame homes, vicinity Mare Island Navy Yard. Owner builds. Total over **$150,000.**

Calif., Vallejo—E. E. Nordlund, 2851 E St., Hayward, 1 story, wood frame homes, vicinity Mare Island Navy Yard. Day labor. Total over **$150,000.**

Conn., Bridgeport—Joseph Frouge & Sons, Inc., 74 Goodsell St., 2 story, brick, steel concrete business bldg., theatre, 3 stores, 8 professional offices, to E. & F. Constr. Co., 94 Wells St. Est. **$165,000.** CD 5/21—ENR 5/29.

Conn., Darien—Delafield & Evers, 160 Post Rd., 15 residences, Post Rd. to shore line. Owner builds. **$150,000.**

Ia., Sioux City—Tri States Theatre Corp., 800 Paramount Bldg., Des Moines, remodeling Capitol Theatre bldg., to W. A. Klinger, Inc., Warnock Blk. Est. **$150,000.** CD 9/15—ENR 9/18.

Mass., Saugus—J. Nason, 3 Lexington Circle, Swampscott, 50 residences, Lincoln Ave., Cliftondale Sect. Owner builds. **$225,000.**

Mass., Saugus—Owner, c/o J. J. Bucchiere, 254 Lincoln Ave., 600 houses, residential development, Newbury Turnpike, to K. V. Wolsey Co., 200 West St., Hyde Park. Over **$150,000.** CD 9/15—ENR 9/18.

Nev., Las Vegas—First National Bank of Nevada, Las Vegas, rein.-con. bank and office bldg., to O. J. Scherer Co., P. O. Box [illegible], Angels Camp, Calif. **$150,000.** CD [illegible]—ENR 8/14.

N. Y., Brooklyn—Waxbro Realty Corp., 1[illegible] Mackenzie St., 32 two family houses, Queens St. Owner builds. **$305,000.** O. I. Silverstone, 153 Pierrepont St., archt.

O., Barberton—Babcock & Wilcox Co., J. E. Trainer, plant supt., 2 story, bsmnt., 46x110 ft. office, to Heller-Murray Co., W. Rayen Ave., Youngstown. Est. **$150,000.** Good & Wagner, 1st Central Tower Bldg., Akron, archt. F. Brosky, 7829 Euclid Ave., Cleveland, engr.

O., Garfield Heights — Holy Ghost Sisters, c/o Sister Superior, 12709 Corlett Ave., Cleveland, masonry contract two 1 story, 96x56 ft. and 104x240 ft., brick dormitory bldgs., to J. Viviana, 7024 Wade Park Ave., Cleveland. Est. **$170,000.**

O., Mansfield — Ohio Bell Telephone Co., Cleveland, 2 story, bsmnt., steel, concrete, brick, stone long distance and repeater station, 131-137 West Second St., replacing present offices there, to A. N. J. Constr. Co., Cochocton. **$150,000.** Awarded 9/16.

Pa., Pittsburgh—L. A. McMullen, archt., Renshaw Bldg., 6 story, bsmnt., 45x160 ft. rein.-con., brick hospital addn., to F. J. Busse Co., 1579 Noblestown Rd., for St. Josephs Hospital, Sister Anna Regina, supt., 2117 Carson St. Est. **$500,000.** Bids about 8/10. CD 8/8—ENR 8/7.

Wash., Seattle—Pacific Constr. Co., 8[illegible] 35 Ave. S.W., 113 houses, centering 9400 block on 21 Ave. S.W. Day labor. **$339,000.**

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Los Angeles — STORAGE — Union Pacific R.R. Co., 15 and Dodge Sts., Omaha, Neb., B. H. Prater, ch. engr., soon lets contract 1 story, 24x70 ft. storage and 2 story, 40x113 ft. commissary bldgs., 3974-3979 E. Wash. Blvd. $43,000. H. L. Gogerty, 1717 N. Vine St., archt.

Calif., Palo Alto—BUS TERMINAL—W. D. Peugh, archt., 333 Montgomery St., San Francisco, soon lets contract, rein.-con. motor bus terminal, for Pacific Greyhound Lines, 5 and Mission Sts., San Francisco, $40,000.

Calif., Richmond — WAREHOUSE — United Grocers, c/o H. F. Genss, archt., 2249 Ward St., Berkeley, wood frame warehouse. $40,000.

Calif., Salinas—WAREHOUSE, etc.—Coca-Cola Bottling Co., c/o C. E. Butner, archt., Winham St., 1 story, 100x120 ft., rein.-con. warehouse and bottling plant. Over $40,000.

Calif., San Francisco—FACTORY—D. and P. Dedomenico, 982 Bryant St., plans being completed by M. J. Ciampi, 821 Market St., factory addns. $45,000.

Calif., Torrance—FACTORY—National Supply Co., 1524 Border Ave., plans by Taylor & Taylor, archts. and engrs., 803 W. 3 St., Los Angeles, structural steel factory addn., 1524 Border Ave. Over $40,000.

Calif., Vallejo — PLANT — Vallejo Steam Laundry, J. J. Madigan, pres., Vallejo, plant addns. $60,000.

Conn., Bridgeport — PLANT — Bridgeport Herald Corp., 299 Lafayette St., revised plans by W. Ginsberg, 331 Madison Ave., New York, N. Y., 2 story, 100x105 ft. brick publishing plant addn., Lafayette St. Over $40,000. Bids 9/6 rejected. CD 9/5—ENR 9/18.

Conn., Bridgeport—TERMINAL—National Transportation Co., Inc., 136 McKinley Ave., 2 story, 130x350 ft., brick, steel, concrete truck terminal, State St. exten. $140,000. Fletcher-Thompson, Inc., 1336 Fairfield Ave., engrs. CD 1/27—ENR 2/6.

Conn., Watertown — FACTORY—Watertown Mfg. Co., Echo Lake Rd., 2 story, brick, steel, resin mfg. plant, $40,000.

Ind., Muncie—PLANT—Kuhner Packing Co., N. Walnut St., rebuilding large portion plant destroyed by fire. $50,000 or more with equip.

Ia., Waterloo—GAS PLANT—Iowa Public Service Co., H. M. Smith, ass't. gen. mgr., Waterloo, imprv. gas plant, to Semet-Solvay Co., Owosso, Mich., $60,000.

Me., Ellicott City — FACTORY — Doughnut Corp. of America, Ellicott City, soon lets contract, 2 story, 80x300 ft. and 3rd floor 80x150 ft., brick, steel factory and office bldg., concrete fdns. $150,000. J. O. Chutkof, 207 W. Franklin St., Baltimore, engr.

Mass., Fitchburg—BOILER PLANT—Fitchburg Gas & Electric Co., 655 Main St., soon lets contract, 1 story, brick, concrete, steel, boiler plant addn. $50,000. Charles T. Main, Inc., 201 Devonshire St., Boston, engr.

Mass., Framingham—PLANT—I. Richmond, archt., 248 Boylston St., soon lets contract, 1 story, brick mill addn. and churn compound plant, Building 15, Herbert St., for Hodgman Rubber Co., Herbert St. $40,000.

Mass., Pittsfield—PLANT—General Electric Co., Morningside Rd., Pittsfield, 1 story, 150x225 ft., brick, steel plant addn., Bldg. 14 and office bldg. Over $150,000.

INDUSTRIAL BLDGS. (Proposed Work, Cont'd.)

Mass. West Boylston—PLANT—Shell Oil Co., Inc., 49 W. 49 St., New York, N. Y., soon lets contract oil terminal bulk plant. $50,000. G. M. Ramsey, 50 W. 50 St., New York, N. Y., engr. CD 9/12—ENR 9/18.

Mich., Detroit—CREAMERY PLANT—Johnson Creamery Co., 3300 Caniff Ave., Detroit, plans by S. J. Stachowiak, 11838 Joseph Campau Ave., Hamtramck, brick, steel, rein.-con., creamery plant. About $70,000.

★**N. J., Newark** — FOUNDRY — American Steel Castings Co., Ave. L, manufacturing and foundry plant expansion, Ave. L. $500,000.

★**N. Y., Bethpage**—FACTORY—Grumman Aircraft Engr. Corp., Sheridan Ave., factory addn. $3,000,000.

N. Y., Jamestown—PLANT—Crescent Tool Co., M. Peterson, pres., Foote Ave. and Harrison St., brick, steel, concrete tool manufacturing addn., Harrison St. Over $50,000. Beck & Tinkham, Bailey Bldg., archts.

N. Y., Jamestown—SERVICE STATION—L. N. Rhodes, 1801 Washington St., plans by C. M. Peterson, Bittersweet, RFD, 1 story, 50x100 ft., brick, steel, concrete service and sales station addn. $40,000 with equip.

N. Y., New York—REPAIR SHOPS—New York, New Haven & Hartford, R.R. Co., Water St., New Haven, Conn., E. E. Oviatt, ch. engr., soon lets contract, altering repair shops, Harlem River Branch, Van Nest sect.

N. Y., North Tonawanda—MILL and SHOP—Meyers Lumber Co., Inc., Island St., 1 story, 70x150 ft., planing mill and woodworking shop, recently destroyed by fire. $50,000.

O., Cleveland — FACTORY — La Ganke & Sons, H. C. La Ganke, pres., 864 E. 140 St., soon lets contract, 1 story, 42x130 ft. brick, steel factory addn., $40,000. McKay Eng. Co., 13124 Shaker Sq., engrs.

O., Cleveland—FACTORY, etc.—E. G. Hoefler, archt., 5005 Euclid Ave., soon lets contract 1 story, brick, steel factory and office bldg. for Star Machine & Tool Co., J. E. Schurger, pres., 9320 Woodland Ave. $40,000. CD 7/30—ENR 8/7.

O., Elyria—FACTORY—Romec Mfg. Co., soon lets contract, 1 story, 100x200 ft., brick, steel factory addn. $70,000. Silsbee & Smith, Turner Blk., archt.

Ore., Roseburg—PLANT—Coos Bay Lumber Co., R. Day, timber supt., Roseburg, lumber manufacturing plant and loading station, Green Station, near here. $100,000.

Pa., Johnstown — POWER PLANT—Bethlehem Steel Co., R. E. Hough, genl. mgr., Locust St., bids soon general contract power plant addn., imprvs. $100,000 exclusive of equip. W. C. Frank, c/o owner, co. ch. engr.

Pa., Latrobe — FACTORY —American Locomotive Co., G. E. Meyers, local plant mgr., Latrobe, plans nearing completion 1 story, 50x118 ft., brick, steel, concrete factory addn. R. H. White, N. Jay St., Schenectady, N. Y., co. constr. engr.

★**Tex., Longview**—PLANT—Premier Oil Refining Co., Longview, J. R. Parten, 2nd Natl. Bank Bldg., Houston, chn. Bd., aviation gasoline plant. $1,730,000.

Va., West Point—GENERATING PLANT—Chesapeake Corp., electric generating plant addn., $100,000. M. S. Mays, West Point, engr.

Wis., Wausaw—WAREHOUSE, etc.—Wausaw Service Co., plans by G. Foster, Jr., 327 3 St., 1 story, 60x100 ft., and 1 story 40x40 ft., brick, tile, warehouse and repair shop bldgs.

Alaska, Ketchikan—WAREHOUSE—H. F. Brenan Co., Ketchikan, 2 story, 80x149x179 ft., timber warehouse. Over $50,000.

Alta., Calgary—GRAIN ELEVATOR—Alberta Pacific Grain Co., Ltd., East Calgary, grain elevator. $50,000.

B. C., Vancouver—STORAGE SHED—W. R. Carpenter (Canada) Ltd., bids soon storage shed addn. $120,000.

N. S., New Glasgow—PLANT—Malagash Salt Co., New Glasgow, plant. $60,000.

Que., Montreal—FACTORY—Belgo Canadian Co. Inc., 455 Craig St., factory. $40,000.

Que., Montreal—PLANT—Ronalds Co. Ltd., 6306 Park Ave., printing and lithographing plant. $50,000.

Que., Montreal—PLANT—Ciba Co., Ltd., 759 Victoria Sq., bids soon converting 9 story garage into plant for manufacture dyestuffs and pharmaceuticals, St. Monique and Cathcart Sts. $200,000.

Que., Montreal — PLANT — Dupuis Freres Ltd., 865 Ste. Catherine St. E., plans by H. S. Labelle, 2 Kelvin Ave., Outremont Ave., plant exten., Brewster Ave. $90,000.

Que., Montreal—PLANT—Stuart Bros. Co. Ltd., 202 Youville Sq., factory addn. $40,000. T. Pringle & Co., Ltd., 485 McGill St., engrs. CD 7/31.

BIDS ASKED

Bids Asked About October 1

Md., Baltimore—FACTORY—Locke Insulation Co., 2501 S. Charles St., 1 story, 50x90 ft., brick, steel factory addn., concrete fdns. W. S. Austin, Md. Trust Bldg., engr.

Bids Asked About October 25

Md., Baltimore—SHOPS—Maryland Drydock Co., Fairfield, shop bldgs. and boiler house,

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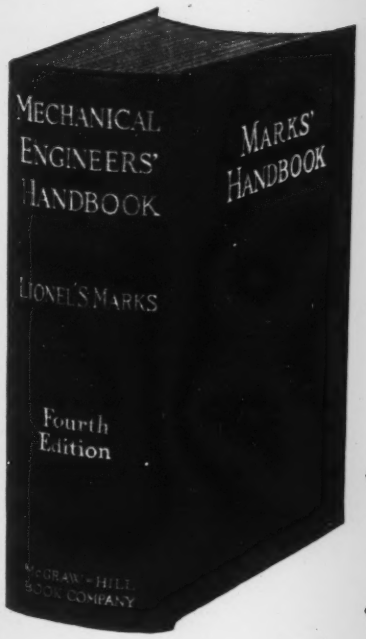

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INDUSTRIAL BLDGS. (Bids Asked, Cont'd.)

machine shop, 70x120 ft., electric shop, 180x200 ft., brick, steel, 1 story. $250,000. J. E. Greiner Co., 1201 St. Paul St., engrs.

Calif., San Jose — GARAGE — G. E. Sobey, Amer. Trust Bldg., remodeling existing garage, constructing 1 story, wood frame and brick addns., for L. L. Normandin, c/o archt. $40,000.

Mass., Lynn — FACTORY — J. C. Pitman & Sons, Inc., 711 Broad St. (selected list bidders), 2 story, 35x122 ft., brick factory addn., Broad St. $40,000. G. A. Cornet, 14 Central Ave., archt. CD 8/25—ENR 8/28.

N. J., Jersey City—WAREHOUSE—Clorax Chemical Co., 51 Pacific Ave., 1 and 2 story, 86x260 ft., rein.-con., steel warehouse Pacific Ave. J. Rothstein, 220 Hutton Ave., archt.

O., Elyria—CASTING CLEANING — Elyria Fdry. Co., W. F. Gollmar in charge, Filbert St., 1 and 2 story, 20x65 ft., brick, steel casting cleaning bldg., 2 overhead cranes. $30,000. O. D. Conover, 1740 E. 12 St., Cleveland, consult. engr.

Pa., Reading — FURNACE — Muhlenberg, Yerkes & Muhlenberg, archts., Ganster Bldg., 1 story bldg. to house open-hearth furnace, for Reading Pratt & Caddy Div. American Chain & Cable Co., Tulpehocken St. and Lebanon Valley R.R. $40,000.

Tex., Corpus Christi—WAREHOUSE—Corpus Christi Transfer Co., Corpus Christi, 2 story, 115x126 ft., concrete, structural clay tile warehouse. $70,000. Morris & Noonan, 801 Builders Exch. Bldg., San Antonio, archts. and engrs.

Utah, Ogden—ENGINE HOUSE—Union Pacific R.R., H. B. Prater, ch. engr., 1416 Dodge St., Omaha, Neb., (selected list bidders) 8 stall engine house.

Ont., London—FACTORY—A. H. McPhail, archt., Canada Bldg., Windsor, candy factory, Oxford St. for Daisy Dale Candy Co. Ltd. $45,000. CD 9/17.

LOW BIDDERS

O., Cleveland — FORGE and MACHINERY SHOP — Champion Machine & Forging Co., H. W. Foster, pres., 1 and 2 story, 60x100 ft. machine and office and 145x400 ft. forge shop, 50 ft. high, from Sam W. Emerson Co., 1836 Euclid Ave. **$340,000.** CD 9/2—ENR 9/4.

CONTRACTS AWARDED

Calif., Berkeley — FACTORY — Linde Air Products Co., 4050 Watts St., Emeryville, 1 story, concrete, steel factory, 1 story, brick garage, to Austin Co., 1001 Ray Bldg., Oakland. **$111,000.** CD 7/28—ENR 7/31.

Calif., Berkeley — PLANT — Manasa Block Tanning Co., Ltd., 1300 4 St., plant addns., to J. J. Moore Co., 354 Hobart St., Oakland. **$45,000.**

★**Calif., Long Beach**—PLANT—Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, airplane manufacturing plant addn., to J. P. Walker Co., 3900 Whiteside Ave., Los Angeles, **$12,619,096.** Taylor & Taylor, 803 W. 3 St., Los Angeles, archts. and engrs.

Calif., Oakland—PLANT—H. J. Kaiser Co., Latham Square Bldg., concrete-mix plant, Middle Harbor Rd. Owner builds. **$60,000.**

Calif., Oakland—WAREHOUSE—J. F. Todd, 152 Hazel Lane, 1 story warehuose. Owner builds. **$40,000.**

Calif., San Francisco — WAREHOUSE — Regal Amber Brewing Co., 675 Treat Ave., 1 story, rein.-con. warehouse, to H. E. Rahlmann, 251 Kearny St., **$60,000.** H. C. Baumann, 251 Kearny St., archt.

Calif., San Francisco—PLANT—West Coast Sea Foods Co., 433 Bay St., 1 story, wood frame plant, to Jacks & Irvine, 620 Market St. **$45,000.**

Conn., Bridgeport—PLANT—Jennings Bros. Mfg. Co., E. S. Jennings, pres., 219 Elm St., repairing, imprv., remodeling, brick, steel plant, Elm St., to J. L. Simpson, 41 Putnam St. Est. **$40,000.** CD 9/10—ENR 9/18.

Conn., Hartford—FACTORY—Maxim Silencer Co., 58 Homestead Ave., 1 and 2 story, 100x130 ft., and 2 story, 35x100 ft., brick factory addns., to Industrial Constr. Co., 721 Main St. Est. **$125,000.** CD 8/25—ENR 8/28.

Conn., New Britain—BOILER PLANT—Fafnir Bearing Co., 37 Booth St., 1 story, 42x55 ft. boiler plant, 1 story, 15x20 ft. gas mixer building, 1 story, 15x15 ft. pickling house, all brick, steel, concrete, Myrtle St., to Aberthaw Co., 80 Federal St., Boston, Mass. **$40,000.**

Conn., New Haven — WAREHOUSE — New Haven Tobacco Co., 158 State St., 2 story, bsmnt., 70x100 ft., brick, glass brick, steel warehouse, to Brooklawn, Inc., 304 Edgewood St. Est. **$50,000.**

Kan., Kansas City—FACTORY—Fruehauf Trailer Co., Fairfax Dist., 1 story, 180x1500 ft. factory addn., to Collins Constr. Co., Davidson Bldg. Est. over **$40,000.** C. E. Keyser, 609 Minnesota Ave., archt. Awarded 9/13. CD 9/12—ENR 9/18.

Md., Baltimore—BOTTLING PLANT, etc.—Pepsi Cola Bottling Co., 25 and Robb Sts., 1 and 2 story, 50x130 ft., brick, steel, bottling plant and office, concrete fdn., 400 Key Hy., to Consolidated Engr. Co., 20 E. Franklin St., **$50,000.** A. C. Radziszewski, 20 E. Lexington St., archt.

Md., Curtis Bay (sta. Baltimore)—FACTORY—Davison Chemical Co., Curtis Bay, 1 story, part 2 story 50x100 ft. factory addn. to Rust Eng. Co., Clark Bldg., Pittsburgh, Pa., **$50,000.**

★**Mass., Lynn**—PLANT—Lynn Gas & Electric Co., 90 Exchange St., design and construction brick, steel, concrete electric generating plant addn., Broad St. to Stone & Webster Engrg. Corp., 49 Federal St., Boston. Est. **$500,000.**

Mass., Somerville (br. Boston)—SALES AND SERVICE—J. Kolligian, 64 Winchester St., Arlington, 1 story, 60x275 ft., brick, steel, sales and service bldg., McGrath Hy., to E. Tashian, 77 Boylston St., Watertown. **$45,000.**

Mich., Detroit—FACTORY—Albert Kahn & Associates, archts. and engrs., 345 New Center Bldg., 1 story, 280x360 ft., steel, concrete, brick factory, to Darin & Armstrong, 2041 Fenkell Ave., for Chevrolet Motor Div. of General Motors, Corp., 1840 Holbrook Ave. Est. **$280,000.** Bids 9/2. CD 8/27—ENR 9/4.

Mo., St. Louis—GARAGE, etc.—St. Louis Pub. Serv. Co., 39 St. and Park Ave., reconstructing street car barns into motorbus garage and service bldg., 3820 Eastern Ave. to Westlake Constr. Co., 1919 Railway Exch. Bldg. Est. approx. **$150,000.**

N. J., Bayonne—REFINING PLANT IMPROVEMENTS—Standard Oil Co., of New Jersey, 26 Broadway, New York, N. Y., imprv. oil refining plant, Constable Hook, 1 story, 70x22 ft., new sweater bldg., own forces. **$40,000.**

N. J., Fords—FACTORY—Heyden Chemical Co., 50 Union Sq., New York, 4 story, 50x60 ft., brick, steel chemical factory, Meadow Rd., to M. Riesz, 871 King Georges Rd. **$70,000.**

N. J., Jersey City—FACTORY—Richards Chemical Wks., 190 Warren St., 2 story, 63x100 ft., brick, terra cotta block chemical factory addn., to Hudson Concrete Constr. Co., 454 Montgomery St. Est. over **$40,000.** H. K. Smith, 921 Bergen Ave., engr.

N. J., Jersey City—MACHINERY HOUSE, etc.—Pennsylvania R. R. Co., W. D. Wiggins, ch. engr., Broad St. Sta., Bldg., 1617 Pennsylvania Blvd., Phila., Pa., 10x8½x10 ft. high brick, concrete machinery house, 24x12x12 ft. deep coal hopper, 18x12x8½ ft. deep ash pit, 80x7½x5 ft. deep inspection pit, and concrete wall, to Wilson & English Constr. Co., 50 Church St., New York City. **$40,000.**

N. J., Jersey City—WAREHOUSE—Metro Glass Co., 135 West Side Ave., 1 story, 60x255 ft., steel and metal siding warehouse, 1 story, 40x80 ft., steel and metal siding addn., 1 story, 40x80 ft., 10x40 ft. addn. and alterations existing warehouse, West Side Ave., to G. Siegler, 26 Journal Sq. Est. over **$40,000.** C. Goldberg, 898 Bergen Ave., archt.

O., Cincinnati—DISTILLERY—National Distillers Products Corp., 7818 Anthony Wayne Ave., general contract 103x298 ft., brick, rein.-con. distillery, Paddock Rd., Carthage, to Frank Messer & Sons, Inc., 2515 Burnett Ave., approx. **$200,000.** Sanderson & Porter, 52 William St., New York, N. Y., engrs.

O., Cleveland—FACTORY, etc.—Cleveland Cap Screw Co., J. W. Fribley, pres., 2917 E. 79 St., factory and storage, to R. E. Nixon Co., 1737 Euclid Ave. Est. **$40,000.** Awarded 9/16. H. M. Morse Co., 1500 E. Superior Ave., engr.

O., Cleveland—FACTORY—General Hard Chromium Plating Co., 13000 Athens Ave., 1 story, 60x140 ft. brick, steel factory, to George A. Rutherford Co., 2725 Prospect Ave. Est. **$40,000.** Awarded 9/15. F. A. Katonka, 11408 Continental Ave., engr.

O., Cleveland — SUBSTATION — Cleveland Electric Illuminating Co., W. H. Hartman, purch. agt., 2 story, bsmnt., 33x112 ft., brick, steel, concrete, electric substation to Sam W. Emerson Co., 1836 Euclid Ave. Est. **$75,000.** Awarded 9/11. C. R. Vicholo, c/o owner, engr.

O., Columbus—FACTORY, etc.—J. I. Case Co., Racine, Wis., 1 story, 93x162 ft., rein.-con., brick, steel factory and warehouse, to L. E. Ruisinger, 81 Frebis St., **$40,000.** Awarded 9/16.

★**Pa., Kittanning** — PLANT — Linde Air Products Co., subsidiary Union Carbide & Carbon Co., W. F. Barrett, chn. Bd., 30 E. 42 St., New York, N. Y., brick steel manufacturing plant, boiler house, garage, office bldg., Buffalo Twp., to James Stewart & Co., 230 Park Ave., New York, N. Y. Est. **$1,500,000.** S. R. Donellon, 205 E. 42 St., New York N. Y., company engr.

Pa., Pittsburgh — BREWERY — Pittsburgh Brewing Co., H. H. Myers, purch. agt., 5340 Liberty Ave., general contract brewery alterations, to H. A. Bloedel, 3720 Ruggles St. Est. **$50,000.**

Pa., Uniontown—PLANT—Uniontown Newspapers, Inc., S. W. Calkins, pres., 2 story, 74x150 ft., structural steel, rein.-con. newspaper plant, to Wm. C. Funk, 514 S. Winebiddle St., Pittsburgh. Est. **$160,000** incl. equip. H. W. Altman, 306 Fayette Title & Trust Bldg., archt.

Pa., Wilkes-Barre — WAREHOUSE — T. C. Thomas, 155 S. Penna. Ave., 1 story, 60x103 ft., brick, steel wholesale produce and fruit warehouse, etc., to O. J. Behrens & Son, 179 Blackman St. Est. **$75,000.** CD 7/3—ENR 7/10.

R. I., Providence—POWER PLANT—Nicholson File Co., 23 Acorn St., 1 story, 50x120 ft., brick, steel, rein.-con. power plant, Acorn St., to Rowley Constr. Co., 260 Central Ave., Pawtucket. Est. **$50,000.** Jenks & Ballou, 2600 Industrial Trust Bldg., engr. CD 9/9—ENR 9/18.

★**Tenn., Cordova** — PLANT — National Fireworks Co., West Hanover, Mass., design and construction anti-aircraft ammunition plant, to Foundation Co., 120 Liberty St., New York, N. Y. Est. **$500,000.**

Tex., Corpus Christi—PLANT—Hydrosil Clay & Chemical Co., 2513 N. Port Ave., chemical manufacturing plant. Owner builds. Over **$40,000.**

Tex., Houston—PLANT—Rath Packing Co., Waterloo, Ia., and 2117 Walker St., Houston, packing plant addn., to Geo. P. O'Rourke Constr. Co., Oil & Gas Bldg., **$71,000.** J. S. Bartley, Waterloo, La., ch. engr. CD 8/21—ENR 8/24.

Wis., Beloit—PLANT—C-Z Chemical Co., 1447 Argall St., 1 story, 50x300 ft., steel, brick chemical bldg. addn., to Fred Froebel, Beloit. F. H. Kemp, 312 Highland Ave., archt.

Wis., Manitowoc—KILN—Wisconsin Malting Co., 618 S. 19 St., 5 story, 37x77 ft., rein.-con., brick, tile Kiln Bldg. 4 addn., to Hamann Constr. Co., N. 8 St. and Reed St. L. E. Peterson, 312 E. Wisconsin Ave., engr.

Wis., Milwaukee—FACTORIES—A. O. Smith Corp., 3533 N. 27 St., 350x400 ft. and 200x600 ft. factories, to Peters Const. Co., 2901 N. 38 St. CD 9/5—ENR 9/11.

Alaska, Ketchikan—WAREHOUSE—Ketchikan Wharf Co., 1 story, 50x194 ft., timber warehouse, pile fdn., to H. F. Brennan Co., Ketchikan. Est. **$45,000.**

Alta., Edmunton—PLANT—Swift Canadian Co. Ltd., Union Stock Yards Toronto, Ont., 1 story, 97x171 ft., structural steel, brick, concrete plant exten. to Poole Constr. Co. Ltd., 218 Tegler Bldg. Est. **$40,000.**

Man., Rathwell—GRAIN ELEVATOR—United Grain Growers Ltd., Hamilton Bldg., Winnipeg, grain elevator, to Harper Constr. Ltd., 124 Grain Bldg., Winnipeg. Est. **$70,000.** CD 9/4—ENR 9/18.

N. B., Moncton—PLANT—Swift Canadian Co. Ltd., Stockyards, Toronto, Ont., plant addn., to R. MacLaughlin, 50 Enterprise St. Est. **$70,000.** CD 9/10.

Ont., Belleville—PLANT—Deacon Shirt Co. Ltd., W. B. Deacon, pres., 311 Front St., plant addn. to Dickie Constr. Co. Ltd., 17 Yorkville Ave., Toronto, **$40,000.** CD 7/2—ENR 7/10.

Ont., Long Branch—PLANT—Small Arms, Ltd., 7 Lake Shore Rd., plant addn., to Ramsay Contg. Co. Ltd., 39 Indian Road Crescent, Toronto, about **$75,000.** Allward & Gouinlock, 57 W. Bloor St., Toronto, archts. CD 9/19.

Ont., Ottawa—PLANT—British American Bank Note Co. Ltd., 262 Wellington St., Ottawa, plant alterations, repairs, to Ross-Meagher, Ltd., 7 Echo Dr., **$75,000.** J. A. Ewart, 165 Sparks St., archt.

Ont., Ottawa — PLANT — Ontario Hughes Owen Ltd., 529 Sussex St., scientific instrument plant exten., to Ross-Meagher Ltd., 7 Echo Dr. **$40,000.** CD 9/10.

Ont., Pembroke—PLANT—Consolidated Paper Corp., Ltd., 1615 Sun Life Bldg., Montreal, Que., reconstructing plant, own forces. **$98,500.** CD 7/30

Ont., St. Catharines—FACTORY—McKinnon Industries, Ontario St., 1 story, brick, steel factory addn., to Ontario Constr. Co., 31 Queen St.; steel, to Standard Constr. Co., Port Robinson. Total est. **$75,000.** Awarded 9/17. A. G. Nicholson, 46 Queen St., archt.

Ont., Toronto—WAREHOUSE—Wm. Halliday & Son, 271 Forest Hill Rd., warehouse, King and Peter Sts. Owner builds. **$70,000.** W. Ralston, 16 Rowanwood Ave., archt. CD 9/8—ENR 9/18.

Ont., Toronto—GARAGE—G. Rodanze, c/o Central Ont. Transports Ltd., 253 W. Wellington St., truck terminal bldg., to Bradford-Hoptal, Ltd., 1170 Yonge St. **$40,000.** CD 8/28—ENR 9/4.

Ont., Windsor—PLANT—Union Gas Co., Ltd., 185 W. Chatham St., plant exten., to Robertson Constr. Ltd., Imperial Bank Chambers. Est. **$40,000.**

Que., Kilmar — MILL — Canadian Refractories, Ltd., 606 Cathcart St., Montreal, remodeling mill, day labor. **$40,000.**

Que., Montreal—MILL—Maxwell & Pitts, architects., 1159 Beaver Hall Sq., planing mill to Foundation Co. (Quebec) Ltd., 1639 Sherbrooke St., for E. J. Maxwell, Ltd., 5080 St. Ambrose St. **$54,000.** CD 9/10—ENR 9/18.

Que., Noranda — WAREHOUSE — Mic-Mac Mines, Ltd., 105 St. James St., W. Montreal, warehouse, office, dry house, bunk house, 20 cottages, Bousquet Twp., to Hill-Clark-Frances, Ltd., 9 St. Est. **$55,000.**

Que., Rouyn — MILL — Normetal Mining Corp., 350 Bay St., Toronto, Ont., mill addn. to Hill-Clark-Frances, Ltd., 9 St., Noranda, **$45,000.**

Sask., Regina—WAREHOUSE—Van Egmond & Story, archts., 1013-14 McCallum Hill Bldg., warehouse, Winnipeg St., for Imperial Oil, Ltd., 1 St., to Bird Constr. Co. Ltd., 7 and Smith Sts. **$50,000.** CD 9/5—ENR 9/18.